VOL. XXIV. NEW YORK—THURSDAY, APRIL 13, 1911—CHICAGO No. 15

THE AUTOMOBILE

What Causes Car Depreciation?

What Are the Remedies That Should Be Applied?

Telling of the impositions that are being put upon the automobilist, stating the relations that exist between the maker and the user of the automobile, making it unnecessary for any of the prime contenders to discuss the evils of the automobile, since it is more to the point for them to eliminate the evils that surround automobilists. That there is an economic problem it is safe to conclude, but it is the purpose here to show that the doctors are unconscious of the situations that abound in their own front yard and are gazing at the green fields beyond.

NIGHT SCENE UNDER THE LAW—HEADLIGHTS MUST BE DIMMED

DEPRECIATION is the microbe that destroys the integrity of an investment, and if the rate of depreciation of property exceeds a certain level, the property must rank as an economic evil. If the earning power of property—as, for instance, an automobile—is so great that interest on the investment is assured after all expenses are paid, the depreciation factor of the investment becomes a mere bookkeeping detail, and the integrity of the investment is not then assailed by this item. In order to intelligently discuss the automobile from the point of view of depreciation, instead of taking the illustrations from the total of the products manufactured in the United States, reference will be made to the performance of cars in New York, hoping thereby to keep the figures down to a level that will not be beyond comprehension.

Granting that there were 33,000 automobiles placed in the hands of users thereof within the last twelve months, in New York City alone, and that 12,000 automobiles were disposed of to users in contiguous territory, it may be considered that these figures will bring the total of the automobiles in operation in the State of New York up to 60,000 in round numbers, which is another way for

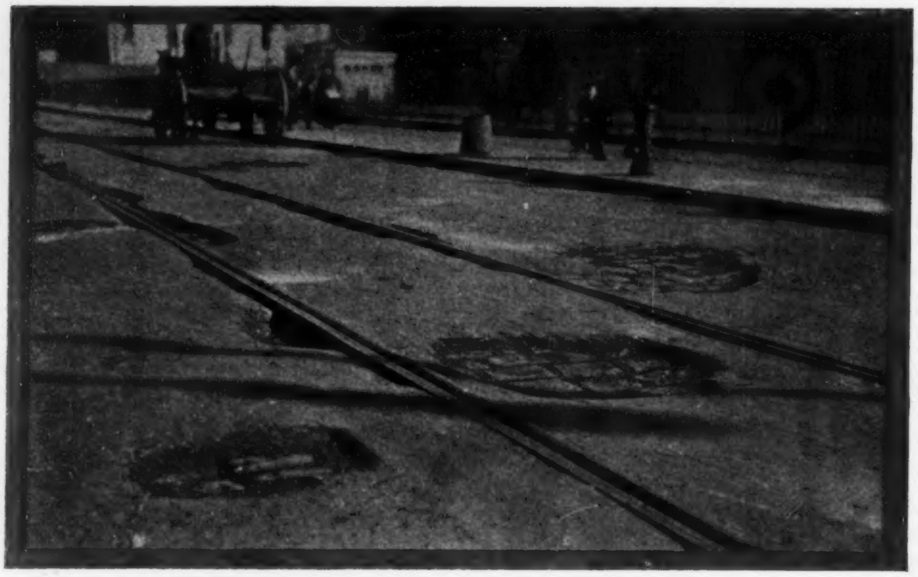


Fig. 1—Several samples of "depreciators" on Tenth Avenue, between 19th and 20th Streets

saying that the citizens of the Empire State have taken $100,000,000 in round numbers out of other channels, putting this money into automobiles, hoping thereby to realize a better return upon the investment than will be possible in a savings bank at 4 per cent. or in Government bonds.

Unless it can be shown that this investment of $100,000,000 is a better one than all of the other types of investments that are available to the citizens of the Empire State, there will be reason for believing that the 60,000 buyers of automobiles in this State alone were poor judges, and that they should have known better than to place their funds where they did. In view of the fact that fully 100 bankers and financiers of world-wide fame cooperated in a project which had for its foundation the getting of automobiles for them, and in view of the further fact that probably every banker and financier in the Empire State is the owner and operator of an automobile, it is as much as to say that these bankers and financiers do not know how to invest their money advantageously, provided only the conclusion may be reached that an automobile investment does not pay.

Come to think of it, there are very few of the class known as longshoremen who purchase automobiles, nor can it be claimed that this character of investment is indulged in to any great extent by the workingman *per se*. It would be hard to convince a jury that bankers and financiers are mistaken in their judgment when they put their money into automobiles, and that workingmen display the necessary measure of acumen, and the reason why it would be difficult to arrive at any such conclusion is bound up in the incontrovertible fact that bankers and financiers at this time are comfortably endowed with funds, whereas the workman *per se* has no such claim to distinction.

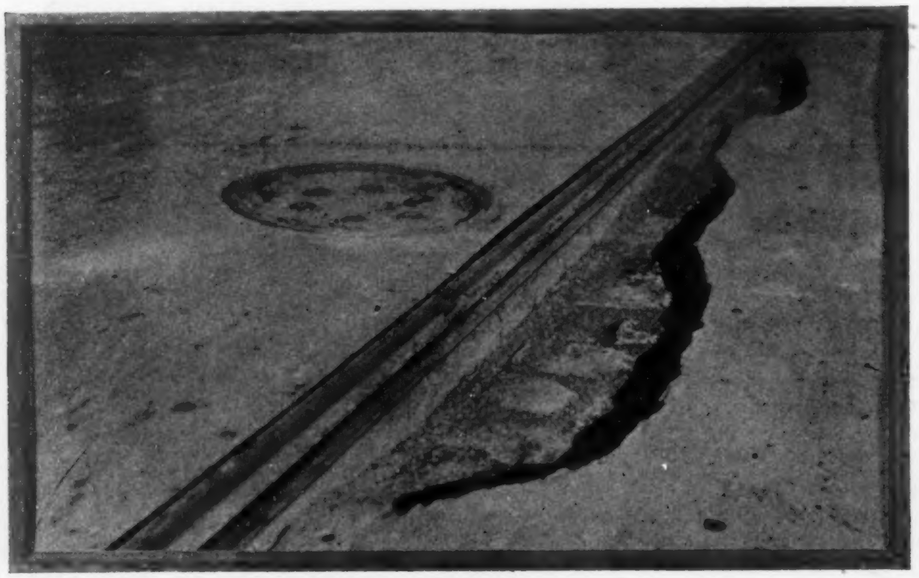


Fig. 2—Knife-edge cavity to be found at Madison Avenue and 24th Street

Since the weight of evidence is in favor of the man who buys an automobile, and in view of the fact that the actual buyers of automobiles are successful men who insist upon getting a return on their money, it remains merely to discuss the pros and cons of the process by which, in addition to conserving the integrity of the investment, reforms may be instituted such as will bring about a more substantial state of affairs and better returns than have been realized heretofore.

The very fact that the owners of automobiles are men of affairs makes it necessary to show them that the bettering of the situation will be worth while. When a busy man is confronted by a situation, if some of his time must be taken in a process of alleviation, the first question that he will ask is, Will it be worth the candle?

It should be worth while to conserve the $100,000,000 investment, but whether or not this is being done to the fullest limit is a matter that will be left to the reader after the facts are put before him. An investigation of the situation as it obtains in New York, as conducted by THE AUTOMOBILE, leads to the conclusion that $93,400,000 is the expenditure for one year, representing the cost of keeping $100,000,000 worth of automobiles on the road for the same time; but it would not be fair to say that this amount of money should be classified as depreciation.

The items that belong in the regular maintenance column may be set down as follows:

(a) Gasoline and lubricating oil....	$10,000,000
(b) Garage charges................	14,400,000
(c) Wages to chauffeurs and others..	27,300,000
(d) Interest on investment at 5 per cent	4,000,000
(e) Tires and tubes................	27,200,000
(f) The purchase of parts for replacements	2,000,000
(g) General overhauling work.......	5,500,000
(h) Regular repairing operations....	3,000,000

In an analysis of these broad items of expenditure, the item (a) represents the equivalent of the oats and hay consumed by horses when they are used to do the same character of work, and striking a balance for this part of the account, it is enough to point out that the cost of feeding the horses that would be required to do the work that is being done by these automobiles would be considerably more than the figure as above given.

Referring to the garage charges (b), it is enough to point out that it would cost more to house the same number of horse-drawn vehicles than it does to protect these automobiles in the garages.

The problem of the chauffeur and the other employees in garages, as referred to in (c), is being worked out, and to the man who looks beyond the horizon of his own nose, the end will be of great economic value, due to the fact that the men who attended horses will go back to the rural districts where they belong, and the men of mechanical bent will take charge

of the automobile. Anything that will send men back to the farm will be of the greatest possible economic advantage, and if mechanics are given charge of automobiles, it will be all the better for them.

Passing the item (d) referring to the interest on the investment, the item (e), referring to tires and tubes, becomes the mainstay of this discussion. A matter of $27,300,000 for tires and tubes is certainly worth looking into, and the habit of going after the tire makers is so strong that it is hard to resist; but the facts in the case are such as to warrant approaching the subject from another angle. The fact that the tires as used on automobiles outside of the city of New York, and perhaps other metropolitan districts of this character, will last for 10,000 miles more often than not, leads to the question—the great main question, let us say—Why is tire mortality so great in New York City?

Fig. 3—One of the worst examples of bad street repairing—at Eighth Avenue and 29th Street

The Average Automobilist Overlooks the Fact That His Investment in a Car Must Include His Investment in the Road Upon Which the Car Rolls

Every citizen has equal rights upon the highway, but each citizen must pay for the highway in proportion to his use thereof. The man who does not own and operate an automobile does not have to pay for the tires that are worn out if the highway is maintained in a poor condition. To this man it is only necessary to pay for the shoe-leather that is dissipated, but he does not have to extend payment to include the undue depreciation of street cars he rides in because they roll on steel rails instead of over bad pavements.

The problem of the taxpayer is somewhat complicated, and his position is increased in its complexity if he owns and operates an automobile. For the sake of simplicity the broad question of the taxpayer will be set to one side, and the detailed question of the owner and operator of an automobile will be taken up in its stead. If a man can operate a car on ordinary country roads, and get four times as much tire mileage out of his car as he would be able to realize were he to run the same on the streets of New York, is it not equal to saying that the automobilists of New York City are paying the enormous sum of $20,475,000 per year, not for the maintenance of streets, not for legitimate tire depreciation, but because the streets are not maintained?

It is an incontestible fact that tires do last four times as long outside of New York City as they do in New York City. This makes it possible to reassert with firmness that there must be something about the streets of New York that is costing the citizens thereof who ride in automobiles the sum of $20,475,000 in addition to all the other taxes they pay, including the moneys that they are assessed for the paving of streets and the maintenance thereof.

If there is anything the matter with the streets of New York that will adequately account for these enormous figures, there should be no difficulty in showing what it is, and the story is worth telling because if it can be shown that a certain type of difficulty will bring about such a startling result in New York, then it must be inferred that the same class of trouble will fall to the lot of the automobilist in Philadelphia, Boston, Chicago or elsewhere.

In the search for the trouble it would be natural to infer that it might reside in the quality of the pavement employed, and it is reasonable to assume that some types of pavement are more destructive to tires than others. It would be no far stretch of the imagination that would lead to the contention that the cobblestone pavement so much in vogue in the Borough of Brooklyn would be very destructive on pneumatic tires, but it would not pay to explore this phase of the situation at very great length owing to the fact that automobilists shun this type of pavement and go miles around rather than to travel a few blocks over its roughened surface. There would be a little choice between traversing Belgian-block pavement and a well-kept asphaltum pavement, and it would require a fine display of discrimination to determine the effect upon tires of asphaltum and properly laid wooden-block pavement.

Should it become necessary to determine the effect of the different kinds of pavements upon pneumatic tires as they are employed in automobile work, the investigator would first look around

Fig. 4—Another point where the old Belgian block pavement is exposed—Eighth Avenue between 28th and 29th Streets

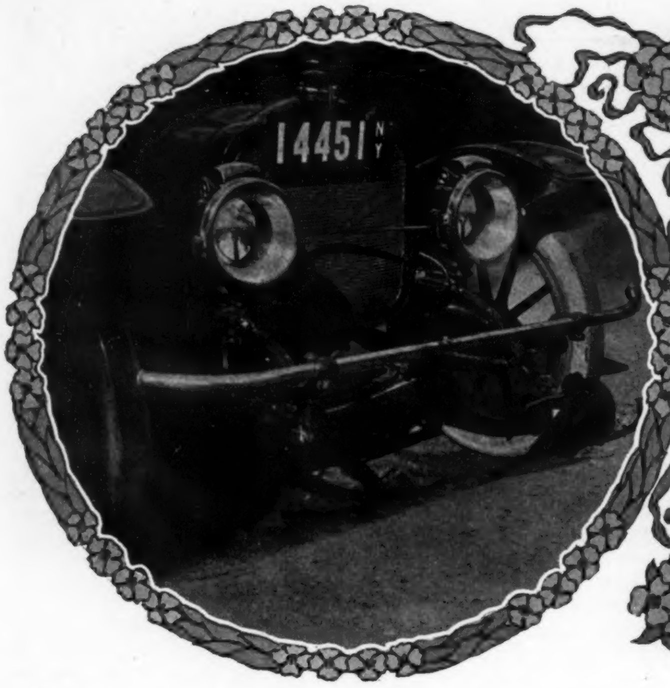


Fig. 5—A very bad place on the great White Way at 72nd Street

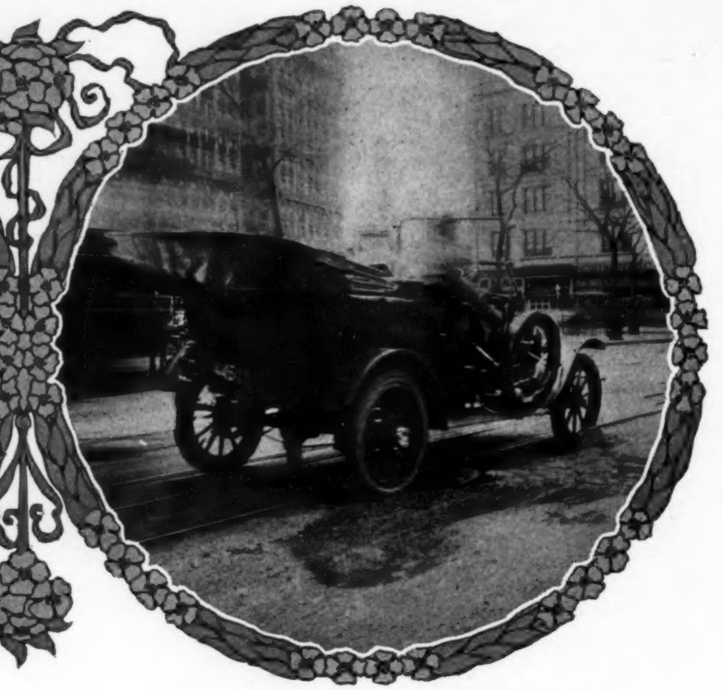


Fig. 6—Another bad spot in the same neighborhood

for good examples of the respective types of pavement upon which to make the experiments. Were this problem put up to a man in Timbuctoo he would not suspect that it concealed a difficulty, and he would travel from that far-off place to the city of New York, nursing pleasing thoughts for every foot of the way; but on arrival at the place of landing, and after a search for a duration of a month, perhaps, despair would creep into his vision, and he would begin to wonder whether or not it would be possible to conduct an experiment such as this on Manhattan Island, or in any other place under the control of the government of New York City.

The Investigator Would Be Chasing a Mirage and He Would Be Casting His Lot in the Company with Despair

Granted that an investigation of the pavement in the city of New York would lead to stretches thereof that are in good condition, it remains to point out that these stretches of good pavement only serve as the traps for the unwary, for the simple reason that they are barely long enough to enable the driver of an automobile to coax his machine up to a reasonable speed for no better purpose than to run it into a chuck-hole at a sufficiently high rate of speed to disrupt the tires and do other damage besides. The depreciation of automobile tires is lower on country roads than it is in the city of New York for the simple reason that the roadway is bad all of the time, and the speed at which the cars are run over these relatively poor roads is uniform and consistent with the road condition.

It would be better, and certainly it would cost much less, were the streets of New York not paved at all, for then the automobilist would have to drive at the slow speed indicated by unpaved streets, and the dangers of chuck-holes and other products of neglect would be entirely eliminated. We have ofter wondered if the men whose duty it is to pave streets and maintain them in good condition own and operate automobiles at their own expense, or whether the cost of maintenance of these automobiles comes out of the public treasury. There is but small chance that any of these officials have to pay the tire bill on the cars they run, for they must know that the neglected pavement of the city is at the bottom of 75 per cent. of the tire maintenance under which automobilists stagger, and if they had to go down into their own pockets for their share of this cost, it is a moral certainty that they would take some of the money they control and fix the streets to keep themselves from being beggared.

As an indication of the civic clear-headedness of the citizens of the Empire State, the sum of $50,000,000 is being employed in the building of State roads, and this enterprise is being duplicated in almost every State in the Union, so that it cannot be claimed by those who are responsible for the maintenance of the highways that the public, as represented by the taxpayers, is niggardly in its policy. In the city of New York there seems to be a surfeit of worthless methods, and this condition is exemplified by the fact that the taxpayers have to sustain a special assessment to cover almost every improvement they get, so that the moneys that come from the annual budget, and are assessed on the taxpayers, should be available for the maintenance of streets and the supporting of the various enterprises normal in an enlightened community.

Public Policy Dictates the Maintenance of Streets and Roads in Good Condition and the Elimination of Public Officials Who Fail to Do Their Plain Duty in This Regard

Whether or not the officials who have charge of the maintenance of the pavements of the streets of New York are from Arkansas we do not know, but we call to mind the answer that a native of Arkansas gave to a traveler who, in riding along on horseback, observed that the native's cabin was sadly in need of repair, and who ventured the inquiry: "Neighbor, why don't you repair the roof of your house?"

"Stranger, when it rains I can't fix the roof, and when it don't rain there is no need of fixing it."

In order to show that it is the wretched condition of the pavements in New York that accounts for the enormous tire bills that automobilists are paying every year, the Editor of THE AUTOMOBILE put the camera men to work, and the illustrations presented in this article represent a few of the many cases of broken pavement, chuck-holes and accumulations of rubbish that serve as the badge of incompetence of the men who are responsible for its presence, and, let it be said, failure on the part of the automobilists to attack their own problem on a basis that will bring to them the greatest measure of success.

Granting that an ounce of intelligence is worth a ton of gold, it is another way for saying that it should be a rare commodity. The fact remains, however, that automobilists exhibit a rare brand of intelligence when they join clubs, thus making the voice of a single automobilist as loud as the combined say of all of the members of the club. But when an automobilist surrenders his right to speak for himself, as he does when he joins a club, his success will then depend upon the policy of the club and the attainments of the leader. If the club decides that the tire bills of the members are far too large to be tolerated, and it then concludes to go into the tire business in order that this terrific demand for tires may be supplied more readily, is it not as much as to say that the club has little or no confidence in the ability of the makers of tires to supply their wares fast enough for the need? In this condition who will claim that the man who lost his voice by joining the club will be satisfied with the result?

Automobile Clubs Seem to Organize for Social Purposes and Fail to Put in Their Best Licks for the Benefit of the Supporting Members

What ground has an automobilist who does not know how to make tires for reaching the conclusion that he will know how to make them if he joins 40 dozen other automobilists who do not know how to make tires? Or, what sense can there be in a situation which permits an automobilist to dissipate his funds faster than will be true under ordinary conditions, in the face of the fact that the real remedy lies in concerted action in the direction that will alleviate the whole situation and reduce the need for tires rather than facilitate the ease with which they may be purchased? Do the members of automobile clubs realize that there are enough of them to compel action on the part of officials who are responsible for the condition which tolerates chuck-holes in the pavement of the streets? Are these automobilists satisfied to spend $20,000,000 per year in New York City alone for tires that are disrupted on account of bad pavement? Are the automobile clubs serving their proper function when they tamely submit to this condition?

Passing beyond the status of the mere member of an automobile club, taking up with the questions that should be handled by the federation of automobile clubs, what is the advantage to be derived from supporting a national organization if this organization does nothing along intelligent lines, such as will lead to tangible benefits to the rank and file whence come the funds to support the national movement? Is it the duty of a national organization to fight the battles of the individual automobilists who pay the bill, or is it the prerogative of this organization to while away its idle hours in divers ways?

Quit whining about the quality of tires! If the tires are not as well made as the average automobilist considers they should be, why abuse them? It is not wise to operate an automobile as it exists at the present time on the basis that an improved future might suggest. The automobilist must live in his own town. It is necessary for him to cope with his immediate problem, and he will have to permit the future to take care of itself, whether he likes it or not. The present situation demands that the roads be fixed and the chuck-holes taken out of the pavement, and in this way the tire maintenance problem will sink to 25 per cent. of its present level, and—who knows?—were tire makers less pressed they might have a little time in which to improve their product.

$20,000,000 May be Saved by the Automobilists of New York City Alone in a Single Year at No Greater Cost Than That of Intelligent Concerted Action

But action is the great question. Just talking about a thing is of no value unless it leads to action. If the 35,000 automobilists who operate their cars within the confines of Greater New York will get together and fight for the removal of the chuck-holes in the pavement in the streets of New York, they will save $20,000,000 in a single year. It would even be wise on the part of these automobilists to donate $20,000,000 to the city of New York for the purpose of fixing these streets. The automobilists under such conditions would be saved the trouble of replacing tires at frequent intervals and automobiling would be a real pleasure. But if the automobilists in Greater New York cannot see their way clear to give the city government $20,000,000 for so worthy a purpose, that is no reason why they should go to a club with their voice removed and allow themselves to be wheedled out of $20,000,000 for no good reason at all.

If the national organization is so busy with "speeding" and other "sport" that it

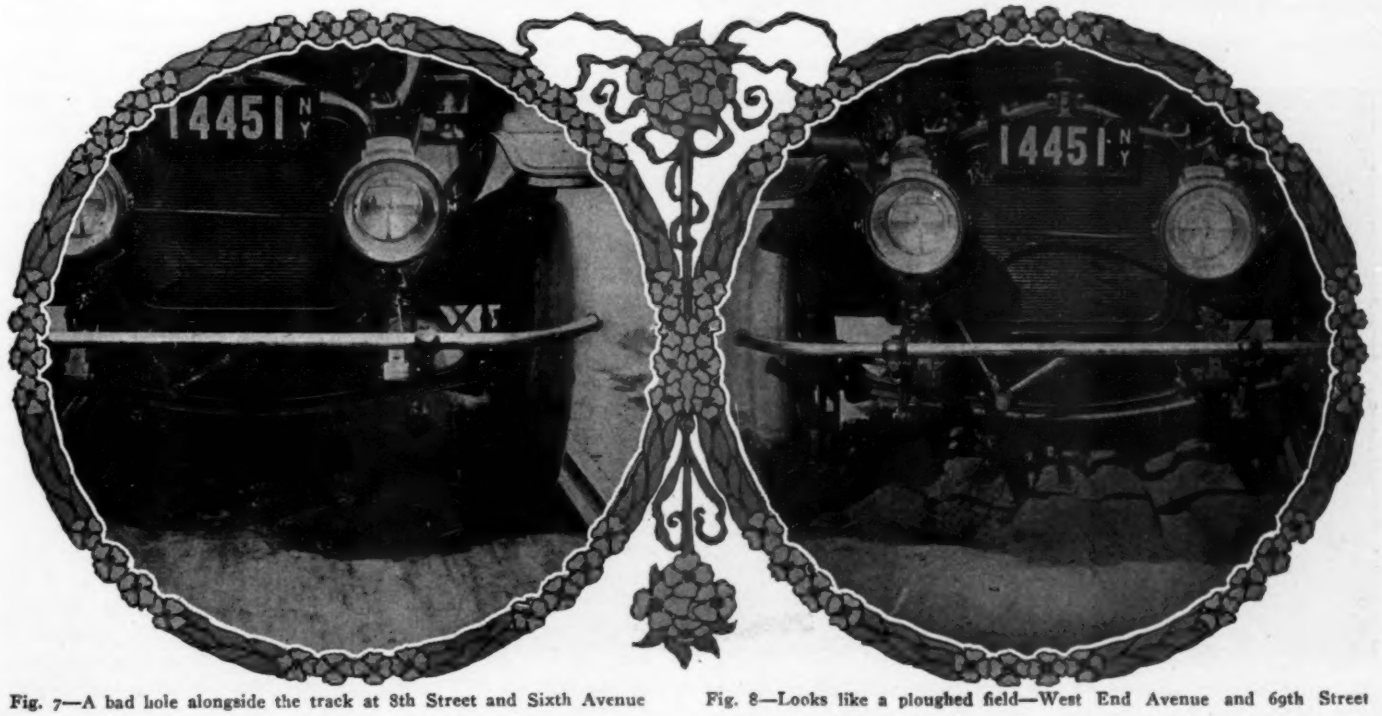


Fig. 7—A bad hole alongside the track at 8th Street and Sixth Avenue

Fig. 8—Looks like a ploughed field—West End Avenue and 69th Street

Fig. 9—Been this way for a very long time—Eighth Avenue and 27th Street

Fig. 10—Several bad spots are to be found on 18th Street between Sixth and Seventh Avenues.

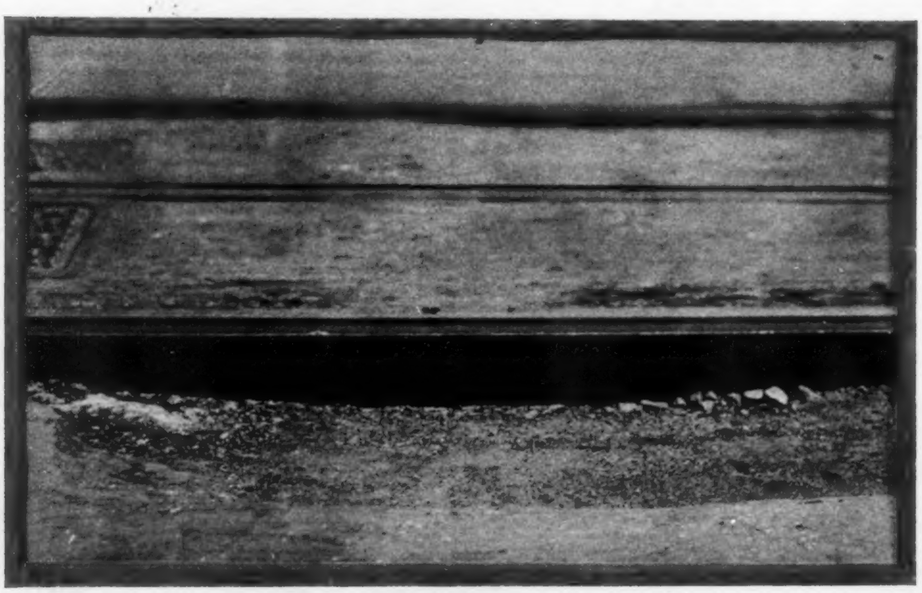


Fig. 11—Close view of a six-inch hole alongside the car track at Madison Avenue and 58th Street

has no time left to do the things that it claims to do for the automobilists who support it, and if the automobile clubs that these car owners belong to have alliances which will not permit them to fight for their rights, the automobilists will have to take the bull by the horns and good, vigorous action along this line would have the effect of promptly removing the pigmy that stands in the way of the repairing of the streets and of reducing the now enormous tire bill.

Depreciation as it is Measured in Automobiles is Not Confined to an Enormous Tire Bill—The Mechanism of the Car Depreciates Also.

It has been shown in tabular form that $10,000,000 represents the cost of work that is done in the upkeep of the mechanisms of the automobiles in New York City alone. Were it not for the pneumatic tires that are used on cars, this bill probably would increase to four times the sum that is represented, which is another way for saying that the presence of pneumatic tires on cars results in a saving to automobilists of, say, $30,000,000 per annum for the cars in question. Statistics seem to indicate that the repair bills, from a mechanical point of view, are four times as much in the city of New York as they are in country districts, and if this is so the repairing of the streets would have the effect of reducing this maintenance account by an amount not far from $7,500,000 within the next year.

Thus far the great main question has been entirely overlooked. A man does not buy and operate an automobile for the pleasure of paying undue tire bills, or for the purpose of keeping repair-shops busy. An automobile is intended to do useful work for its owner; it bestows upon him the measure of health-giving pleasure that is requisite for his needs, and to whatever extent bad roads or other inferior conditions defeat the object, it is the duty of the owner of the car to ameliorate them, and since the voice of one man, as it might be flung against the façade of an inefficient government, would have no more effect than that of a little missile bombarding the hide of a rhinoceros, it represents no more than the most ordinary, meager intelligence to combine and remonstrate.

The men who might get in the way of a plan of remonstration would probably set up the futile argument that the figures of the loss due to the disrupting of pneumatic tires in chuck-holes are too high. The answer to them is as simple as A, B, C. The automobilists who use the city streets are entitled to properly maintained pavement, whether or not the tires are disrupted when the cars slide into chuck-

holes. It would be an intelligent act on the part of these automobilists to advocate that the streets be properly maintained if for no other reason because they look better, and even budding civic pride would cry out against the condition as it is shown in the illustrations in this article.

Borough President McAneny Admits That the Streets of New York Have Recently Been as Bad as Pictured—Present Contracts Call for the Repair of Every Hole by April 1

It has been charged that the sheet-asphalt paved streets in the Borough of Manhattan are the worst in the world. The fact that this condition of streets in the Borough where the traffic is from 10 per cent. to 50 per cent. heavier than it is in any of the other four boroughs constituting Greater New York, should be allowed to exist under notoriously the vilest regulations known to the city, strikes the observer (to put the expression mildly), as constituting a strange state of affairs in the management of the Municipal highways.

Sufficiently lurid color in support of the condition was found as recently as the early part of March, 1911, when holes to the number of 744, aggregating from 12 inches in diameter, to the width of the roadbed, were located in the sheet-asphalt paved streets within the space of 40 blocks, on four highways: Fifth avenue; Broadway; Sixth avenue, and Eighth avenue, respectively. At the same time, these graphic blotches of evidence constituted only the infinitesimal fraction of the number of holes that actually existed throughout the Borough of Manhattan, for there was scarcely a block throughout the 260.50 lineal miles of sheet-asphalt pavement that did not show evidence of blemishes.

If farther proof is necessary, one needs only to quote the Hon. George McAneny, President of the Borough of Manhattan, who gave expression to his views on the occasion referred to; and repeating the same to the writer of this story as late as April 7, in the office of the Borough President, when he said:

"I admit that the streets of Manhattan have recently been as bad as pictured." During the March interview, Mr. McAneny also stated: "By April 1, the present contracts call for the repair of every hole that has been reported, and I believe that 30 or 40 per cent. of the holes shown in the pictures have been repaired since the pictures were taken. Yesterday, 49 gangs were at work; and for a week, more than 40 gangs have been at work whenever the weather has been warm enough to make repaving practicable."

Fig. 12—Bad place on a dark night—at First Avenue and 43d Street

Fig. 13—At 25th Street and Ninth Avenue there is a six-inch hole full of big cobbles that has sent many a good car to the hospital

Fig. 14—Right in the heart of the automobile sales district—Broadway and 57th Street

Just as an illustration, and to express the writer's impressions, made as the result of a ramble at random, let it be said that on April 8, he counted 100 holes in the sheet-asphalt pavement along Eighth avenue, from Thirty-fourth street to Forty-eighth street; while in that portion of Forty-eighth street, from Eighth avenue to Broadway, there were not less than 30 holes. In Cherry street, between Roosevelt street and James Slip, there were upward of 30 holes, varying from 2 feet to 7 feet in area. In Roosevelt street, between Cherry street and New Chambers street, about 15 holes, of all sorts of dimensions were repaired about a fortnight ago; and at the end of ten days, a goodly portion of the work had to be done over again—at an extra expense to the City of New York.

The Borough of Manhattan, on January 1, 1911, had 441.51 lineal miles of paved streets, and, approximately, 10 lineal miles of streets which were unimproved. The kinds of material involved in the paving of these streets, and the number of lineal miles included in the work, as accomplished, according to the official figures, as shown in the map-room of the Bureau of Highways, are as follows:

Sheet asphalt	260.50	lineal miles
Granite block	86.98	" "
Asphalt block	52.99	" "
Old stone	22.11	" "
Wooden block	14.30	" "
Macadam	4.63	" "
Total	441.51	" "

It should be stated that "old stone" refers to trap-rock (blue stone), Belgian block, (the small, square style of paving-stone), and cobble-stone. Under the present system of street-paving in New York City, "old stone" is no longer used in any noticeable measure.

The amount of patches embraced in these repairs is 270,000 square yards, the contract price for doing which is 97 cents the square yard of patches. At the beginning of January, 1911, just 140 lineal miles of the sheet-asphalt out of the total 260.50 lineal miles had gone out of guarantee. That is, the responsibility of the contractors who laid this pavement, agreeing to keep it in repairs under the original ten or fifteen years' stipulation, had ex-

Record of Observations Made on Fifth Avenue, Indicating the Present Condition of the Pavement, Also the Best Reason for the High Cost of Tire Maintenance.

Block above Street.	Side of Street.	Dimensions of Hole: Length, Feet.	Width, Feet.	Depth, Inches.
23d	West	2	2	2
	West	4	1	1
	West	1½	1	1
24th	East	1	1	3½
	East	1	1	2
	East	1	1	2
25th	West	2½	1	2
	West	2	2	1
	West	3	1	1½
26th	West	3½	2	4
	West	4	4	2½
	West	4	1	1
	West	5	2	1
	East	2	1	1
	East	¾	¾	3
	West	3	1	1
	West	6	1½	¾
27th	East	4	3	3
	East	6	7	6½
	West	8	1	1¼
28th	East	7½	2½	5
	East	2	1	1
29th	East	2	2	1¼
30th	East	2	1	1
	East	1½	1½	1½
31st	West	2	2	¾
	West	1	1	1
	West	1	1	¾
	West	1½	¾	1
	West	2	2	1
	East	2	1	1

Block above Street.	Side of Street.	Dimensions of Hole: Length, Feet.	Width, Feet.	Depth, Inches.
	East	6	3½	2
33d	East	3	1	2
	East	3	5½	2
	East	2½	7	4
34th	East	1	¾	2
	West	2	2	1
	West	1½	¾	1½
35th	East	1½	1	3
	East	1	1	1
36th	East	2	3	1½
	East	4	¾	3
37th	West	3	2½	1¼
	East	4	3	4
38th	East	1	1½	1
	East	1	2	1¼
	East	2½	1	2
40th	West	4	1½	¾
41st	East.	1	1½	¾
	West	2	2	1
	West	1	1½	1¾
43d	West	2	4	2
	West	2	1	1
	West	1	¾	1½
44th	West	3	1	1
	West	1	½	1
	West	2½	5	1
45th	West	2	2	2
	West	2	1½	4
46th	West	1	2	1
	West	2½	3	4
47th	West	1½	1½	1

Block above Street.	Side of Street.	Dimensions of Hole: Length, Feet.	Width, Feet.	Depth, Inches.
	East	2	1	1
	East	1½	¾	1
48th	West	1½	2	2
	West	1	1	1½
	West	1	1½	1½
49th	West	1	1	1¾
	West	1¼	1	1½
50th	West	1	1	2
	East	5	4	1
53d	East	1	1½	1
	East	1	¾	2
	West	1	2	1½
55th	Middle	1	½	1
	West	1	¾	1
	West	1	1½	2
	West	3	1½	4½
56th	Middle	1	4	¾
	East	1	1	1½
	East	1	1	2
57th	West	1	1	1
	West	1½	½	2
58th	East	3½	2½	3
	East	1	1	1½
60th	East	2	2	3
	West	1	1½	2
	West	2	1½	1
	West	2	¾	1½
	Middle	1	¾	1½
	Middle	2	½	2
	Middle	3	2	1¾
	East	2	1	2

Fig. 15—After hitting this hole at 27th Street and Ninth Avenue the driver had to stop and repair his tire

Fig. 16—A veritable "bump-the-bumps" which automobilists encounter daily at 27th Street and Ninth Avenue

Fig. 17—This particularly bad hole at 29th Street and Ninth Avenue spells engine jars and tire repairs

Fig. 18—Sufficient to jar the best regulated car into the repair shop—39th Street near Fifth Avenue

Block above Street.	Side of Street.	Dimensions of Hole Length, Feet.	Width, Feet.	Depth, Inches.
	Middle	2	1	2
61st	Middle	1	1	1½
	West	2	1½	2
	West	1	1	2
	East	1	1	1
	West	1½	¾	1
	East	2	2	2½
	East	2	1	2
	East	2	1	1½
	West	1	1	1½
	West	2½	1	2
62d	West	1	1	¾
	Middle	2	1	1½
	East	2	2	¾
63d	East	1	1	1
	West	2½	1	2½
	West	1½	1	3
	West	1½	¾	2
	West	2½	1½	2
	Middle	1	4	1
64th	West	1	¾	1½
	East	6	5	6
	East	3	1½	1
	East	2	3	1½
65th	East	1½	1	1½
	Middle	3	1	1
	West	1	1	1
66th	West	1	1	2
	Middle	1	1	1½
	Middle	3	2½	2
	Middle	1½	1	2

Block above Street.	Side of Street.	Dimensions of Hole Length, Feet.	Width, Feet.	Denth, Inches.
67th	West	2	1	2
	Middle	1	1½	1¾
	West	2	1½	1¾
	Middle	1	¾	1½
	Middle	2	1	2
68th	West	2½	3	2¾
	West	2½	3½	4
	East	1	1	1¾
69th	West	1	1	1¾
70th	East	2	½	1½
	East	1	1	1½
	West	1	1	2
	West	2	1	1½
	West	1	1	1¼
71st	West	1½	1½	1
73d	West	1	1	1½
	West	2	1	2
	Middle	1	1	1¾
74th	East	1	1	1½
	East	2	1	¾
	East	1	1	½
	East	3	1	1
	East	1	1	1½
	East	2	¾	2
75th	West	1	1½	2½
	Middle	3	1	1
	West	1	1½	1¾
	West	2	1	3
76th	West	1	1¼	1½
	West	2	1	1
	West	1½	1	1½

Block above Street.	Side of Street.	Dimensions of Hole Length, Feet.	Width, Feet.	Depth, Inches
	Middle	2	1	2
	Middle	2	1	2
77th	West	1	1	2
	West	2	1	3¼
	West	1½	1	1
	West	2	1	1½
	West	2	2	3
	West	2	1	2½
78th	West	2½	3½	2¾
	East	1	3	1
	East	2	1	3
	Middle	2	2	1½
79th	East	12	2	1½
80th	West	1	1	1
	West	2	2	1¾
	West	2½	2½	1
	West	2	1½	1
	East	1	1	1½
	West	1	1	2
	East	3	2	1¼
	East	1	2	2
81st	East	2	2	1
	East	1	1	2
	East	1	¾	1¾
	East	2	2	2
	East	3	3	1¼
	West	1½	1½	2
	Middle	1½	1	2
	Middle	1	1	1
	East	1	1	1
	West	2	1½	1¾

pired, thus throwing the expense of maintenance upon the shoulders of the taxpayers of New York City. Out of the remainder of the 260.50 lineal miles of sheet-asphalt pavements existing 100 lineal miles remained under guarantee at the beginning of the year, while nominally 21 lineal miles had been abandoned. In other words, this 21 miles will have to be paved anew, under fresh contracts.

The contract to do this repairing was awarded to the Uvalde Asphalt Paving Co.; but not, however, until bids had been called for the third time. On the first bid, the Uvalde Co.'s figures were 95 cents per square yard; the Barber Asphalt Paving Co.'s bid was 93 cents per square yard. These figures did not suit Mr. McAneny, and he saw to it that a new set of bids was offered; with the result that the Uvalde Company put in a bid for 90 cents per square yard; the Barber Co.'s bid remaining the same as formerly, 93 cents. But still the Borough President was not satisfied and he called for another bid; in response to which, the Uvalde Co. bid 97 cents, while the Barber Co.'s bid had advanced to 99 cents the square yard. The contract was awarded to the Uvalde Co.

Some severe criticism having been made over this point, a representative of THE AUTOMOBILE asked Mr. McAneny why it was that the 90 cent bid was ignored and the contract awarded at seven cents higher. "That was done," Mr. McAneny replied, "for the reason that when a higher bid is received on a final bidding, the Municipal administration has no power under the law to revert back and accept a former bid, although it may have been lower than the final bid. My reason for calling for additional bids was due to the fact that last year's repairs had been somewhere in the neighborhood of 77 cents per square yard, and I deemed the 1911 bids as excessive. But what could I do? My hands were tied, by the law. The day before the final bids were opened, a representative of the Barber Asphalt Paving Co. called upon me and said that his company was sure that the Uvalde Co. would get the award. Evidently, his people must have had a way of knowing that the Uvalde Co.'s third bid was still under their own second and third bids. I should have preferred to have it the other way, because the Barber people have the best-equipped plant for doing the work."

It should be understood that this contract to repair the sheet-asphalt pavements of the Borough of Manhattan absolutely does not carry with it any guarantee by the Uvalde Co. to restore the patches in case they should wear out. Once it goes to pieces for the second time it will be necessary to make another contract to repair it, inasmuch as the company's contract calls for putting on patches to the extent of 270,000 square yards on streets specified in the contract.

The city has shouldered the burden to pay the Uvalde Asphalt Paving Co. the sum of $261,900 for putting 270,000 square yards of patches upon the sheet-asphalted streets of the Borough of Manhattan. By paying a sum slightly in excess of this, the city might have its streets paved with new material entirely, and the work guaranteed to be kept in repairs for a period of five years. The 1910 prices paid were, approximately, as follows, the work including the 6-inch concrete base and the five years' guarantee. For sheet asphalt paving, $2.40 per square yard; asphalt block, $2.51; granite block, $3.22; wooden block, $2.20 per square yard. There was no old stone used in paving the streets of New York last year.

The following is the statement of the number of square yards of sheet-asphalt pavement which was out of guarantee on January 1, 1911, in the Borough of Manhattan, showing the year in which it was laid and the total amount:

Year Laid.	Square Yards.	Year Laid.	Square Yards.
1889	10,637	1898	75,928
1890	166,813	1900	143,191
1891	107,257	1901	149,614
1892	108,809	1902	174,331
1893	217,893	1903	623,111
1894	165,206	1904	356,673
1895	119,387	1905	284,122
1896	402,372	1906	191,721
1897	51,303	Total	3,348,368

Germans Repel Aerial Attack

War Automobiles Mount Special Guns

While the American army is wading around in the mud in front of San Antonio, whipping a brigade into shape for efficacious crawling on its belly, the German army is having its "pedals" remade into the shape of automobile wheels, and its artillery is being refashioned to conform to the modern requirement so that aerial attacks may be dispelled, combining this facility with the utility of the same equipment to obstruct the passage of a possible enemy that may be moving along the ground.

PEACE, like every other commodity, has a price. It may be purchased by "coin of the realm," or it may be guaranteed at the cost of military equipment. The idea that the lion will stalk forth from the jungle and lie down beside the lamb in the pasture is as old as the hills, from the poetic point of view, but in actual practice the lion smiles when the lamb disappears. It is not the purpose here to advocate militarism, or to try to usurp the prerogatives of those who are paid to afford to the nation that ample protection which will induce the lion to lie down with the lamb. In the meantime, the automobile, as an economic factor, has proven its worth in commercial pursuits in all civilized countries, and it is being taken up with vivacity by the great military powers of Europe, so that, from our point of view, we know that automobile transportation is a commercial success, and a process of reasoning would lead us to believe that this modern contrivance should supplant the mule in army transportation, and the horse that is used in the movement of artillery. If those who have charge of military matters in this country are so bound down by inertia that they cannot see the force of this contention, the Congress of the United States should be able to arrive at the conclusion that it would be better to send its officials to Germany for the purpose of finding out why the automobile is of exceeding importance in the moving of troops, rather than to mass troops under the conditions of 1861, for no better purpose than to show them "how not to do it."

Fig. 1—Army automobile made at Düsseldorf mounting a special type of gun to be used in repelling aerial and overland invasion

In discussing this matter at the expense of some detail, the civilian is likely to be met by the force of the argument that it takes a military man to impress ladies, and conduct military operations. In the meantime, the answer to this argument has the same foundation as militarism would employ for its defense of the horse and the mule; in other words, if the military man knows about accouterment, it does not deprive the builders of automobiles of the pleasure of knowing how and why they are made.

In its devious ways, the freight automobile is varied to suit the exigencies of the intended service, and as a type of transportation machine, it will bear its burden in sacks of wheat, the products of the loom, and it will be equally uncomplaining if perchance the burden is in the shape of the guns of war. If the freight automobiles are intended for use on velvet carpets, the wheels may be supplanted by primitive casters, and if the pavement of city streets is to constitute the right of way, the wheels may be designed accordingly, but if the by-ways of a military campaign are to be negotiated, it is not too much to expect that the wheels will be designed accordingly.

The arguments that have been put forward, as far as they have been made public, have the sound of a plaint, based upon the use of small diameter wheels and pneumatic tires, such as pleasure automobiles are wont to sport, as they are used by military officers who "fringe" the administration at the seat of government much as a fine costume is adorned by golden lace. Pomp has its advantages, even in a democratic form of government, and that the pompous should ride around in beautifully

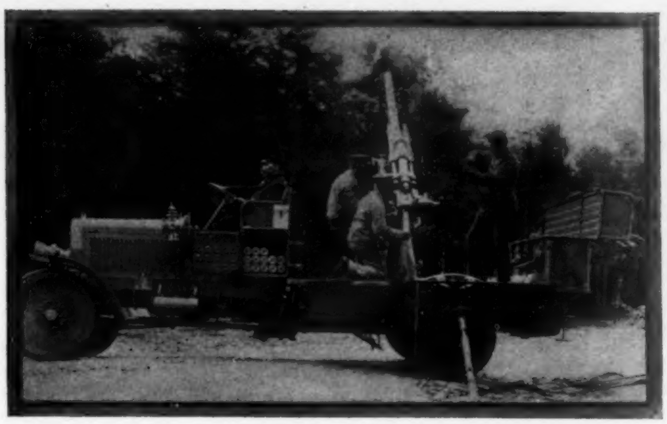


Fig. 2—Showing in a side view the gun platform cleared away and the gun elevated for balloon attack

Fig. 3—Rear end view of the military automobile showing the sprag anchors and tire equipment on the rear wheels

contrived pleasure automobiles, it is fitting to conclude, but when the men who have assigned to them this pleasurable task will have done the work for which they are paid, they are commended by those whom they serve for the adorning work that they do.

Why the facilities that are used in times of peace by those who occupy the position that will have to be taken by fighting men when the time comes should be made the foundation of comparison when it is desired to contrive the proper equipment for real military work is a matter that has never been explained, although history repeats itself, and it is rarely ever that governments which bask in the rays of peace, as a normal occupation, are prepared for the rigors of a war.

That history is repeating itself in the respects as here inferred is shown by the attitude of the government in its high disregard of the capabilities of freight automobiles for military work, and about the best support that has been realized from the government by the makers of automobiles in America thus far comes in the form of four imported machines that the Bureau of Insular Affairs deemed it expedient to purchase and send to the Philippine Islands, but let us hope that the motive that inspired this wondrous liberality has at least as good a foundation as that which inspires the "fond papa," who, on his way home at night, becomes infatuated with a toy locomotive which he purchases and brings home with the anticipation that it will amuse and instruct his "young hopeful."

The experienced automobile engineer finds it extremely difficult to believe that the freight automobiles which are made in France for service on "Roman" roads were designed with the idea that they would do efficacious work in the slough of our ill-concealed possessions on Asiatic shores.

As an indication of the progress that is being made abroad from the military point of view, showing how the German government is taking advantage of freight automobiles in its defence of the Fatherland, the illustrations as here afforded were taken, and in Fig. 1 is shown a Rheinische gun from the works of the gun-makers of this name, at its plant at Düsseldorf, showing the gun mounted on the platform of a military automobile. Our interest for the present is in the automobile, rather than in the gun, and in studying the automobile, it will be seen that the chassis frame is of stout construction, and distance is maintained between the front and the rear axles holding the wheels to parallelism by means of distance rods that are horizontally disposed lying below the chassis frame in the same plane. The motor is of high power, but the gear ratio is such that the automobile is capable of traversing the strategic lines that radiate from the military center to the strategic points on the Imperial frontier. The wheels are of stout construction, with discs supplanting spokes, and the rear wheel construction is made up of three tire units, the middle one of which is of the solid rubber form, and the flanking members are of steel with diagonally disposed "biting" bars, riveted around the periphery

There is no attempt at placing armor on the car, and the weight of the automobile is relatively light, it being the main idea to transport the gun over the roads as they may be, with mobility as the companion idea. Fig. 2 shows the gun in its "elevated" position with the deck of the automobile cleared for action, and the wheels are locked with sprags in place, thus holding the automobile to its position on the ground while the gun is in action. How the ammunition is carried is clearly depicted in this illustration, and the gun-crew of three men are busied about their work. Fig. 3 shows the rear end view of this apparatus in its position of "balloon destroying," and in this view an opportunity is afforded to show how the sprags are used. and it brings into view the tire equipment on the rear wheels of the car. As a criticism of this equipment the non-military mind gathers the impression that the gasoline tank at the rear is much exposed to a stray shot from small arms, but this is a detail that ingenuity would readily overcome.

Solid Gasoline Should Offer Unexcelled Attractions to the Military Engineer and the Criticism Involving the Puncturing of the Gasoline Tank by a Small Arm Missile Would Be Overcome

The point has been made in The Automobile that solid gasoline, so called, offers unusual attractions from certain points of vantage, and the experiments that have been thus far conducted with the process of solidifying gasoline, have such underlying merit and feasibility that the time has arrived to point out to the military that a situation as above referred to would be entirely eliminated by the simple substitution of solidified gasoline for the tank full of liquid as shown in Fig. 3.

If it is wise on the part of the military authorities to experiment with powder for the purpose of obtaining more explosion and less smoke, why is it not in the path of wisdom for the same authorities to look into the matter of solidified gasoline for use in military automobile work, thereby suppressing the dangers that attend the use of liquid gasoline under battle conditions, realizing at the same time the attainment of a higher thermal efficiency, interjecting a new measure of feasibility, and advancing the standard of the American arms to the front rank.

It costs no more of money to take the initiative in a matter of this sort, than would be the cost of lying back and waiting for a foreign power to make all the preparations, and in the event of an international disagreement, the price of being ready is in the nature of "small change" as compared with the paying of a war indemnity. From another point of view, there is ample reason for taking the initiative. If it is hurtful to the pride of the individual to hold the position of a mere copyist, since individuals are the components of a nation, is it not depressing to the national pride to sink to the level of copying?

Darwin Theory and the Automobile

Doctrine Applies Alike to Motor and Man

THERE are two things clear to every man of a mechanical turn of mind. First, that a machine, or transformer of energy, can under no circumstances deliver more work than the amount corresponding to the power received; second, that the intensity of energy decreases during every reaction, while the capacity of energy is ever increasing, i. e., considering a current of electricity, water or heat, the voltage, height or temperature, respectively, at each successive point of the current is lower than at the preceding point; the current flowing from the places of higher to the places of lower potential, location or temperature, respectively. Every energy current flows along the line of least resistance.

The universal validity of these two principles is known to every steam, gas, gasoline and electrical engineer. Small, however, is the number of men who are aware of the fact that these laws, in another form, govern not only all the processes of the dead and living things in nature, but that they are also the principal factors in the evolution of science, industry and commerce.

If a gallon of water of 60 degrees is added to a gallon of 50 degrees the difference in temperature will be equalized so that when the reaction is completed there are two gallons of water of 55 degrees, not considering the various heat losses. The water heated to 60 degrees has *adapted itself* to the temperature of the water of 50 degrees, and *vice versa*. The characteristics of the water, such as its density and dissolving capacity, have been changed correspondingly.

This is also, in short, the principle of adaptation as it was recognized in nature by Darwin. The tendency in all natural reactions is to do away with the differences in the properties (i. e., potential energies) of things; and this aim is approached by the continuous adaptation of the organisms to the stimuli caused by the external energies. This creates, in course of time, in each organism an image of the world outside of it, which is constantly modified but never finished, and the older features of which are ever losing in clearness but are never lost themselves. As the occasion requires, the useful properties acquired during the past are re-developed and the useless qualities stored for future use, so to speak. Naturally, the individuals with the greatest stock of useful qualities survive those who have not been fortunate enough to accumulate so much power and experience, and the qualities in demand are used again and strengthened by this use. This phenomenon is called the selection and survival of the fittest.

But in the problem for adaptation to new conditions Nature does not always find the right solution at once; at times she makes monstrous mistakes in her attempts to create new forms; and when some form is arrived at which cannot be modified any longer it is cast aside and left to its fate, as the hippopotamus, the red man, the kangaroo, etc. When, however, a practical form is reached its representatives are gifted with all the means of preserving, standardizing and multiplying that form, so that it may not be lost and all the hard work of Nature wasted.

Man, who carries Nature's kernel in his heart, copies her in all his doings. He, too, like all the other creatures, continually adapts himself to new influences and varied conditions. When, some ages ago, the earth began to cover itself with a mile-thick stratum of ice man crept into caves; when he found that it was no warmer there than on the outside he took up the fight with the monsters of his day in order to clothe himself with their skins; when he found this insufficient he produced fire to heat his dwelling. The glacial period being past and man having become used to the wearing of clothes, he found a way to make some light tissues of the fibres of plants. And the same ability to adapt himself to a variation of conditions man has since proved on all occasions.

The experiences made by men are systematized, and the essential traits abstracted from them are made into science. Thus science is an economy offering in a limited number of principles the essence of numberless experiences. But to prepare this abstract is a more than difficult task. Error is the path leading to truth, and the ideas abstracted from experience must be modified again and again, as experience is growing. The brain of one hundred and fifty years ago was well satisfied to explain combustion by the action of a "fire-spirit" (phlogiston) changing fuel into its products of combustion. It was only by the most painstaking explorations continued through decades that oxygen and its properties became known, and this knowledge was used to explain the phenomena named. The development of thermodynamics was another fight for knowledge, and the final victory of man enabled him to construct the steam engine. It did not take engineers a very long time, however, to find out that the thermal efficiency of the steam engine was very low, and this led them to experiment with *internal* combustion motors, resulting in the inventions of Beau de Rochas, Otto, Brayton and Diesel.

The importance of experimenting with and selecting the right type of a machine is obvious. An error in this line of work may prove as fatal to the experimenter or investor as Nature's mistake of creating the red man with a great amount of will power and too little intelligence to guide it proved fatal to that race. The importance of the right experiment and correct selection is illustrated by the late Selden patent suit. It cost the automobile industry hundreds of thousands of dollars, only to find out in the end that the inventor "had made the wrong choice," covering in his patent the combination of a road vehicle with the Brayton type of engine, while later developments proved in favor of the Otto type of internal combustion motor. The parties in question probably realize now that business, or at least successful business, is somewhat more than collecting money or conducting a patent suit; it is neither more nor less than a science, and the man who wants to put a new invention on a payable basis must of necessity have just as much gray matter as the man who conceived the new thing.

Then, if business is a science and must be worked along similiar lines, the question arises, How is this to be done? For answer it is only necessary to look at the men and corporations who have turned inventions into profitable commercial propositions. Their work is done on an absolutely scientific basis; it does not matter whether they have gone through college or not; it is a plain question of brains or no brains; and, so far, there exists no college capable of creating this valuable substance. The men referred to not only experiment many times before incorporating any innovation in their product; but they will not even begin to experiment unless the idea of the new thing is in harmony with their previous experience and their ideas about it, i. e., if the idea does not masquerade in the face of plain truth and the gown of probability. If this is not the case these men will no more experiment with the new thing than an engineer would with a

device involving the principle of perpetual motion. In a word, the great laboratory is in their *heads,* the "overheads." There are laboratories of this kind where no mistake can be made; and the principles of adaptation and selection are applied with the same exactness as that working the wheels of a chronometer. Step by step the valuable knowledge is acquired and adapted to the results of practical experiments; bringing forth, at last, products like the modern automobile.

But not only the technical development of an invention requires exact and scientific treatment, but the commercial development necessitates it even in a higher degree. There are a thousand things to be considered before taking up a new business proposition; the cost of making, advertising, selling and shipping the product; the most advantageous method of production; the question whether the maker would be satisfied with a smaller profit during the first period of manufacturing, in order to utilize on a large scale the many experiences made on a small one, or whether it is preferred to start "big" and to run the risk of making some big mistakes; the organization of the work in the factory and office; and a thousand other details which, after having once been settled, seem of small importance, but which are quite capable of becoming big items in the bill if they are not given due attention.

Considerable risk attends the construction of a large number of automobiles with new-type motors or bodies, not knowing whether there will be purchasers for the goods. For example, it was easy enough for any maker to go on building old-style bodies when the fore-door type was entering the field and no one yet knew whether it had come to stay. But the makers who at that time did not watch the trend carefully surely had to pay dearly for it at some later day. To-day it would be impossible for any manufacturer to get rid even of only one hundred bodies of the kind in vogue fifteen months ago. On the other hand, the makers who then took up building fore-door bodies have had no reason to repent their doing so. In the same way, the manufacturers of the Schebler carbureter ascribe to a great extent their success to the fact that when all other makers had reduced their output to the minimum shortly after the panic some years ago they were able to ship several carloads of carbureters promptly. They knew what they were doing in continuing their production at a normal rate, and they knew why they did it—two very important things for every merchant to know.

At the present there are some evolutions in the automobile industry which are being watched with great interest. Time will show how far the expectations set upon the silent motor, the live axle and the double ignition system, which are now being fostered, are justified. Time will also show to what extent and how soon the automobile will displace horses and railroads; there is a desperate fight going on between the various competitors, and there is no doubt that, on the whole, the automobile will be the victor. Automobile manufacturers and railroad men are perhaps more conscious of the fight than are the operators of horse-drawn vehicles; nevertheless, the latter fight their battle, obeying the same law of Nature as the hippo, the red man and the kangaroo.

From a Pioneer Builder

Charles E. Duryea takes issue with "The Automobile" in relation to the mixing of gasoline and lubricating oil, and he points out that it has been his practice to put the lubricating oil in the gasoline, and he looks upon this process of lubricating as adequate for the needs.

WE are working toward that best automobile which is the one that will survive. I dislike to see cold water thrown on anything that is good, leading up to the right goal. Your reply to Mr. Fahnestock, on page 783 in the issue of March 23, referring to the mixture of gasoline and lubricating oil is strictly and literally true, and yet it is wrong. No man would buy milk diluted with peach-juice, or a basket of peaches with greasy cream smeared over them, but we all know that there are but few better dishes than peaches and cream. In the same way, gasoline and lubricating oil mix advantageously. This is not to say that the gasoline assists lubrication.

In a 4-cycle engine some of the lubricating medium is carried to the upper end of the cylinder, and to whatever extent this obtains the lubricating oil is lost in the usual oiling system. It is a habit among racing men to put lubricating oil in the gasoline. In a 2-cycle motor the best way to lubricate is to place the right quantity of lubricating oil in the gasoline tank. If it may be taken for granted that the fuel goes into the crankcase in any event, it may as well be carried in with the lubricating oil. I see an advantage in putting the lubricating oil in with the gasoline. This process assures a condition of good intermingling of the two elements which should assure perfect feeding of the lubricating oil. I claim for this process that the right quantity of lubricating oil reaches the bearings to be lubricated, and that more hard work may be done, with more power and greater economy.

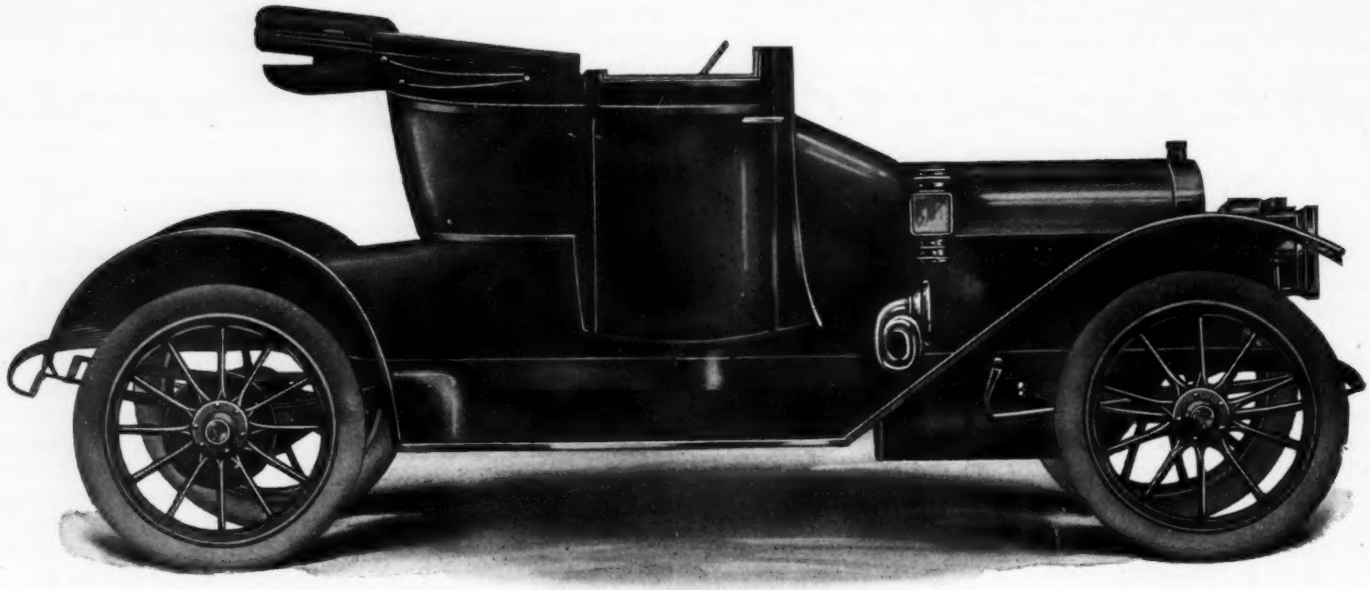
That the oil adds to the volatility of the gasoline it is not my purpose to contend, but I doubt that the pressure of the lubricating oil lessens this property in the gasoline. If I am right in this conjecture, the presence of the lubricating oil in the gasoline does no harm. In my experience, which has been over a number of years, I have found nothing that should be taken as a disadvantage for the process that I am holding out for. You will appreciate the fact that the amount of lubricating oil is a bare 3 per cent., and this can scarcely be regarded as sufficient to seriously influence the working of the gasoline. I am quite convinced that the gasoline evaporates just as fast from such a mixture as it would in the absence of lubricating oil.

Whether the gasoline lessens the lubricating properties of the oil used for this purpose is a question. Gasoline evaporates at a low temperature. This means that the gasoline all distills out, leaving the lubricating oil. The oil that is deposited on the walls and bearings contains no gasoline if the engine is warm. The lubricating oil is therefore unhurt, leaving it just as it would be were it put into the motor through a lubricating system. There is room for question that the gasoline cuts the oil film. Gasoline and oil as used in gas engines are from the same original source, they combine perfectly. They form a lighter oil, nevertheless a continuous one; hence an unbroken film. It is well known that many oils on the market as used for light machinery work are diluted with kerosene oil. If anyone thinks that the addition of kerosene oil will make the product too thin, it remains for him to employ a thicker lubricating oil if it is to be diluted, thus permitting him to arrive at the same point as in the other case.

High Compression a Boon

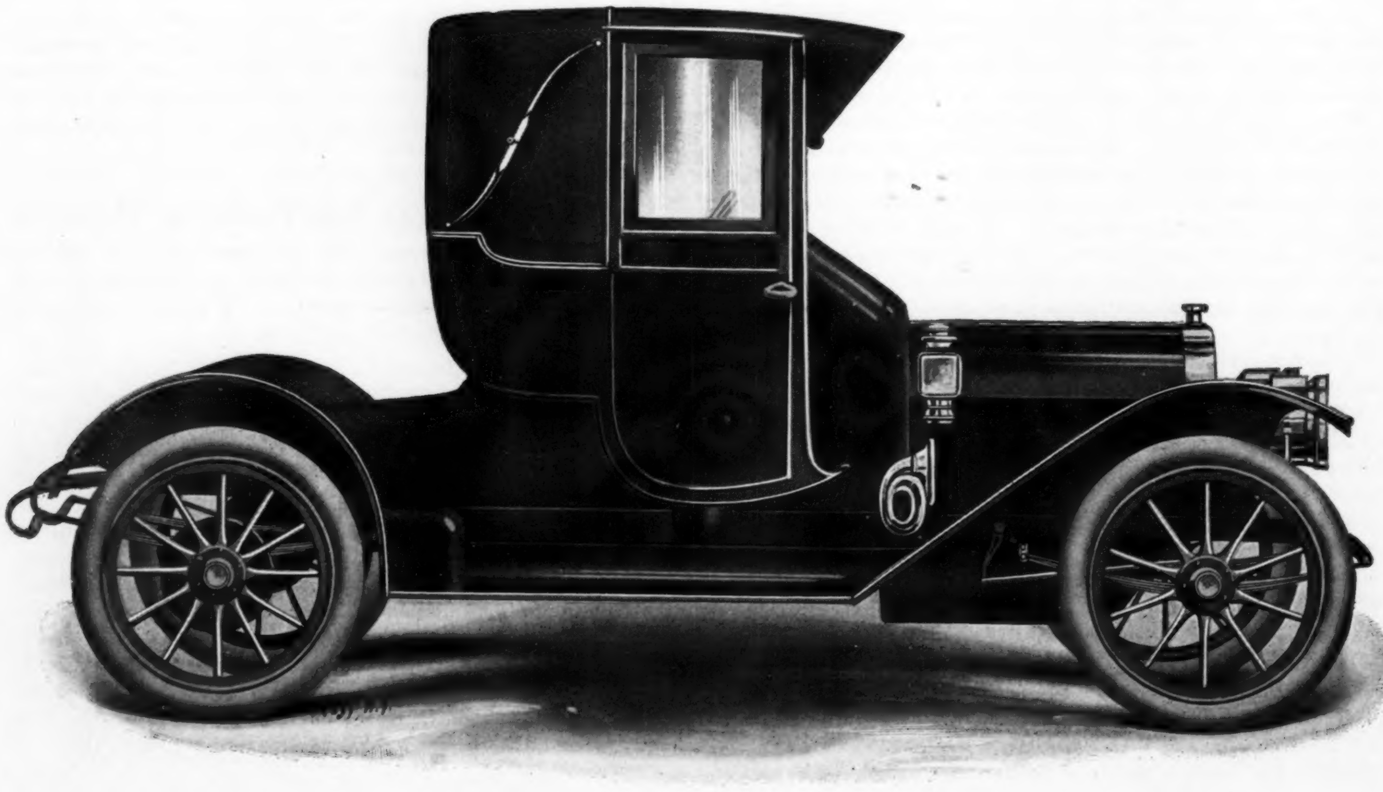
Thermal efficiency is improved with high compression—more fuel is packed into the explosion chamber and the rate of combustion increases as the impression is increased, incidentally reducing losses.

THE rate of combustion is more rapid with increasing compression; this has the advantage of aiding in the accomplishment of the useful work within the shortest possible time, and, since the losses increase as the time taken, it follows that the thermal efficiency is better with the higher compression. Again, since the source of all the power of a motor is the fuel value of the mixture, it follows that the more fuel there is in the cylinder for each power stroke the more power the motor will be capable of delivering, provided the motor is not given a dose of "indigestion" by using too much fuel. Increasing compression results in an increased amount of fuel in the space each time, and, since the combustion conditions are bettered by this increase of compression, it is a fair inference that the superior compression does two things, i. e., it packs the space with a higher weight of fuel, and the conditions for burning the fuel are improved.



Doctors who may not have selected a car of their choice heretofore, and who are sufficiently near action to warrant them in giving the matter serious consideration with a view to action this Spring, if they are without experience at all, may consult others of the profession to advantage, or they may submit the matter to their own power of reasoning, arriving at the conclusion that business is business, and that a doctor's rig can scarcely be up to the best requirement unless it is designed for the intended work. A simple touring car, if it is a large one, represents overmuch responsibility to be shouldered by the doctor who does not take kindly to a chauffeur for reasons of cost, or otherwise, and considering the nature of the service, including regular calls during inclement weather, and by night, a well-made car of somewhat light construction, but with large-diameter wheels, including a type of top that may be folded back when the sun shines, and adjusted to form a tight enclosure in wintry weather, offers excellent attractions.

The illustrations here given are of a special design of body by the staff designer of THE AUTOMOBILE, *which is offered as a suggestion to the doctor of some discrimination, and for want of a better designation, it may be called a "Collapsible Landaulette." This body is fitted onto a relatively low-priced chassis of a well-known make, the idea being to arrive at a fair version of the appearance of such an undertaking, and the particular feature of the design, apart from its utility, has to do with the details of the top as it is folded down, provision being made to part the framing of the door in the manner as shown, and to so contrive the front that it will slide down into a pocket, and the pillars at the four corners also fold down flush.*



The Engineering School Graduate

His Strong Points and His Weaknesses

At the Fiftieth Anniversary of the Granting of the Charter of the Massachusetts Institute of Technology, Henry P. Talbot, Professor of Inorganic and Analytical Chemistry, presented the paper of which the following is a résumé. He urges industrial managers to give engineering students summer employment in their plants, believing that such a course would prove mutually advantageous.

THE complexity of the educational problem is nowhere greater to-day than in the training of the engineer, using that term in a broad sense to include the man who applies his science to concrete ends, whether he be, for example, civil engineer, research chemist, or field geologist. The boundaries of all the sciences have been extended at a rate which has far outstripped any reasonable alteration of educational methods to meet these changing conditions; for, over against the charge of undue conservatism which is commonly made with respect to educational practices should be placed the fact that seven years is the minimum period which must elapse before the ultimate success or failure of an educational experiment can be determined, and since the remodeling of a course or system of instruction to utilize successfully such of the new acquired knowledge as it is possible to include must often be the result of gradually accumulated experience, it is plain that rapid and frequent alterations are both unwise and unprofitable. Such advances in scientific knowledge as, for example, those relating to wireless telegraphy, the turbine engine, or aeroplanes, which are of such immediate significance as to seem to imperatively demand a place in our courses of instruction, cannot be allowed to displace other older topics of permanent importance, and in many cases these later developments of science are based upon abstruse principles, the proper teaching of which, in turn, demands much time.

The product of the engineering schools has not escaped the universal demand that all products should advance in quality without increase in cost, which, in this instance, means with little or no increase in time expenditure. One needs only to review the conditions of the last quarter century to realize that an extraordinary change has taken place in the position of the engineer in the community. None of the older professions have been called upon to face such kaleidoscopic conditions and it is not strange that there should be a dearth of men immediately adapted to meet the altered situation, or that many should be found to be partially lacking in the extremely composite training which would lead to complete command of the field. It may not be irrelevant to ask whether the so-called learned professions, so long regarded as superior to the engineering professions, would have fared distinctly better under a like extreme test.

The wholly successful engineer of the day must be a man possessing a capacity for logical, quick and exact thought; a detailed knowledge of some portion and a broad knowledge of the whole of his professional field; and be master of a certain amount of the technique of his profession. He must have the ability to select and guide competent and trustworthy associates and to obtain from them loyal and willing service. It is a matter for sincere rejoicing that the engineering profession has reached such a commanding position in our national life that only a man of this type can completely fill it.

The most obvious function of the engineering school is to afford a fundamental knowledge and understanding of the principles of the sciences underlying engineering operations. Failure to do this seems to be without excuse, yet it is almost inseparable from another important function, namely the development of the power to think (for there can be no adequate understanding of principles unless one can think logically in terms of them when considering concrete problems), and it is just at this point that much of the current criticism is aimed.

Let it be remembered that some responsibility for this condition rests upon our public school system, and also that the sort of thinking which the engineering professions demand is of a kind which is more exacting than is essential in the more common vocations, and that no system of education has yet succeeded in training a large proportion of exact thinkers, however much such a result is to be striven for.

The public has a right to look to the engineering schools for sound instruction in fundamentals, including, of course, physics and chemistry, as well as the mathematics and drawing which must form a part of the equipment of every competent engineer. In addition, they may demand that the fundamental principles and something of the technique of those subjects which are of general application within a given profession shall be thoroughly taught, and that this shall be done with reference to development of power and the inculcation of useful habits, rather than the mere acquisition of information. While this is a demand which no engineering school would desire to evade, let us recognize that it is, of itself, no light task to accomplish.

But in our epitome of the distinctly successful engineer of mature years were included breadth of knowledge within and without his profession, the quality of leadership, which means power of imitation and a knowledge of men, and the ability and inclination to fulfill the requirements of good citizenship. Are the graduates from the engineering schools, as a class, in line to develop thus symmetrically?

One serious difficulty which technical schools are encountering has been frequently referred to by recent writers but deserves a mention here, namely, that of securing and holding broad, cultured teachers. Specialization has invaded the teaching profession, especially in scientific lines where the mastery of any large field of knowledge to a degree corresponding to the needs of the expert is rarely possible. The specialist is apt to use the microscope far oftener than the field glass and this habit is partially reproduced in his students. It is encouraging to note that certain schools are now recognizing the need of men who are efficient teachers with a broader outlook to deal especially with the younger men. They are recognizing that not every eminent specialist or successful investigator is a successful teacher, more particularly in this very matter of breadth of view, and are leaving the specialists greater opportunity for the presentation of their specialties to the older classes, while improving the instruction in the more general courses. It is obvious that these difficulties are enhanced by the larger financial rewards which tempt the broad-minded engineer away from the schools.

If the inculcation of breadth of view and love of the refined in life is difficult, the development of qualities of leadership is even more so. That these qualities are largely conferred at birth will be generally admitted, but the criticism of lack of leadership is really directed toward an alleged culpable lack of facility in getting the best from others, of appreciating the point of view of others or of presenting our own views to others.

The real function of engineering schools is the training of capable engineers and it is very easy to pass the line beyond which

there is grave danger that both the quantity and quality of individual attainment will be lowered because of time and energies devoted to social affairs. Let the schools realize by all means their responsibilities for the development of men as well as engineers, and encourage by precept and especially by example an interest in all that tends toward a better understanding on the part of our students of their human relations, including prudent encouragement of the so-called "student activities." But let those who lack a realization of the great changes which the student life at our technical schools has already undergone in the last few years, and who therefore constantly clamor for more of what is called "college life," reflect that one of the greatest assets which a graduate from one of these schools can take with him when he leaves it is the well established habit of "doing a day's work in a day," of meeting his obligations on time, and let him realize that this cannot be reasonably demanded if the instructors must in fairness accept excuses because of an undue diversion of time and energy to other things. Although the sciences actually owe many of their advances to "grinds," it is probably fortunate that few of our engineering graduates of to-day belong to that class; but there is little likelihood of an undue increase in the proportion of such over-developed scholars under existing conditions.

There is a large store of energy, combined with a desire for opportunity to work and ability to render intelligent and willing service, which goes to waste in the summer because students are unable to secure temporary positions. This is particularly true in the industries into which chemical engineers and chemists will go. The net return in value to a concern from this temporary service is not relatively large, especially during the first summer, and in certain industries there is a risk in trusting to the integrity of these men with respect to information acquired regarding operating methods. But one cannot avoid the conviction that if industrial managers would co-operate with the engineering schools in the consummation of an arrangement whereby young men whose ability and character could be vouched for could be given summer employment for two or three of the successive summers intervening during the four years of study, the concerns thus co-operating would actually find that they would derive appreciable benefit from the plan. That it would enable the schools to add at least 50 per cent. to their efficiency so far as these students are concerned there is no question whatever, and surely no better means could be afforded for the acquisition of a knowledge of the problem of the laborer in the works. These young men should not be placed at once in positions of responsibility, but rather in such positions as will afford them working experience under industrial conditions. In the third summer the majority of such men might be utilized to much advantage in the immediate direction of specific processes or operations, they themselves acting under general or specific direction.

While it is no doubt true that, from its nature, chemical engineering offers less abundant opportunities for industrial work during the vacation interval in a student's career than many other professions, notably less than civil engineering, and at the same time is a profession the actual practice of which it is exceedingly difficult to reproduce in an educational plant, similar general conditions exist in other lines. Here, again, is a problem with no small dimensions or importance and one step toward its solution may be made through the greater co-operation on the side of the industrial managers.

American Cars in Germany

There is a market in the Kaiser's dominion for small, light-weight, low-priced chassis, but the average Teuton, it is said, has a prejudice against anything in the automobile line that is not manufactured in Continental Europe.

GERMANY offers a market for the sale of automobile chassis which would sell for $750, not more, delivered, or $1,000 for cars with bodies attached. There has been a passing of the demand for expensive and high-powered automobiles, moderate-priced machines of genuine merit having received the call. What is necessary on the part of American manufacturers are well-stocked agencies, which would have the effect of doing away with the necessary delay caused by the shipment of parts and accessories from America every time an order is to be filled.

Up to the present time American manufacturers have not made any sanguine attempt to get into Hamburg, without which earnest effort it is impossible to sell goods in Germany, the populace having a firmly grounded prejudice that American-made automobiles go to pieces more rapidly than machines manufactured in Continental Europe.

Elementary Talk on Steel Composition

By E. F. Lake, M. E.

Discussing the characteristics of iron and steel, stating the effect of carbon, relating the relative effect of other elements, indicating the proportions of pearlite, cementite, and ferrite, and charting the strength that corresponds to the carbon content in conventional work—this discussion is purely for the man in the shop who has no time to give to the questions involved on a broad basis, but who desires to acquaint himself with the principles that underlie intelligent handling of steel in the shop.

CARBON is the most important of all the elements or materials that are used in the manufacture of steel products or that are naturally present in the ores or finished metal. In dividing steel products into different grades, the division is based on the carbon content in the vast majority of cases. Other elements may form the basis in various alloys, but most of these are sub-divided according to the percentage of carbon. It unites with pure iron in all proportions up to 4 1-2 per cent. and by adding a high percentage of manganese to the metal the carbon content can be raised to 7 or 8 per cent.

It has been demonstrated that each increase of 0.01 per cent. of carbon increases the strength of pure iron anywhere from 750 to 1,150 pounds per square inch, until about 0.90 per cent. has been reached, after which the carbon begins to separate into graphitic carbon. When 2.00 per cent. of carbon is reached, the graphitic carbon is very pronounced, and beyond this point the metal is usually in the form of cast iron. The percentage of carbon that produces these increases in strength is out of all proportion to the mass of metal with which it is combined. This is one of the wonders in metallurgy, as no other combination gives anywhere near such results.

Manganese and nickel have practically the same effect on iron as does carbon, but nowhere near in the same proportions. Thus

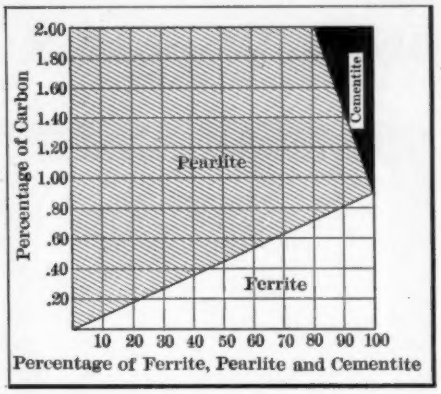


Chart 1—Indicating results of combinations of iron and carbon in annealed steel

the results obtained with 1.00 per cent. of carbon could not be obtained with less than 7.25 per cent. of manganese, or 17.55 per cent. of nickel. All three of these cause the metal to undergo a structural change from pearlite, that includes the sorbitic, to martensite, that includes the troostitic, and then to the polyhedral structure, and with none of them is a special carbide formed. Chromium has an analogous effect, but not as complete as a double carbide of iron and chromium forms, and this is not maintained in solution in the iron without tempering.

The desired percentage of carbon is given to steel in different ways in the different steel-making processes used. The Bessemer process burns out all of the silicon first, then the manganese, and next the carbon, after which the desired amount of carbon is re-charged before pouring the metal into ingots. In the open-hearth process the excess carbon, present in the pig iron, is oxidized out by boiling the metal until the carbon has been reduced to the desired percentage. In the crucible process muck-bar (a form of wrought iron that contains 0.10 per cent. of carbon or less) is used for the base or stock, and when this is charged in the crucible charcoal is added to give the metal the desired carbon percentage.

Still another well-known method is used to add carbon to steel products, and that is the carbonizing process. With this method a low carbon metal is heated to about 1650° F. and then caused to absorb carbon from the outside by packing it in some carbonaceous material, such as bone and charcoal, or submitting it to the action of a carbonaceous gas in a sealed chamber or retort.

Proportion of Carbon in Iron and Steel

When the carbon content of the iron products is below 0.10 per cent., the metal is called wrought iron. From 0.10 to 0.30 per cent. it is called soft or machinery steel and cannot be hardened enough to prevent a file from cutting it. When the carbon content is from 0.30 to 2.00 per cent. the steel can be hardened so as to cut other steels or metals, and is then called tool, half-hard, hard, or high carbon steel. Exceptions might be made to the term hard steel, as it is possible to make steels very hard with manganese, tungsten or chromium, and still have a low percentage of carbon.

Each increase in the percentage of carbon, increases the hardness and brittleness of steel and makes it more liable to fracture when cold, or when heated suddenly. The tenacity shows a pronounced increase up to a carbon content of 0.90 per cent. and a slight increase from there to 1.20 per cent., after which it rapidly decreases. The ductility keeps decreasing from the minute carbon begins to show in the metal. It decreases rapidly when the carbon content is raised from 0.30 to 0.90 per cent., but before and after this the decrease is comparatively slow. These properties are graphically shown in Chart 2.

The difference in strength produced by each increase of 0.01 per cent. of carbon should show the necessity of drawing the contract specifications as close as possible for steels used in automobile construction. The degree of hardness also increases with each increase in the percentage of carbon; and the hardening properties are likewise increased. As a general rule, hardness and strength increase simultaneously in all metals, up to a certain point. Hence specifications that allow from 0.25 to 0.35 per cent. of carbon would cover a range that would give two entirely different products. A 25-point carbon steel cannot be hardened in the ordinary acceptance of the term, while a 35-point carbon steel can be hardened so a file will not cut it and it can be used as a tool for cutting metals. This 10-point variation would give a difference in strength of from 7,500 to 11,500 pounds per square inch.

Strength and Lightness in Construction Depends Upon Material Used

In designing a motor car, in which lightness is a factor, this amount of variation in the strength of metal would hardly be allowable, and might cause trouble. An allowance of 10 points variation in the specifications for carbon, when the percentage is as low as in the above-mentioned steel, would make it look as though these specifications were drawn in the interest of the steel makers and the needs of the steel users were ignored. A variation of 5 points is all that is needed in making steels of this grade and is as much of an allowance as is asked for by steel makers who turn out a good product.

The actual mode of existence of the carbon in steel is of great importance when working and heat-treating it. Annealed steel, when polished, etched with acid and examined under the microscope, should show the carbon in the form shown in Chart 1. As will be seen by this chart, a steel containing 0.90 per cent. of carbon will show 100 per cent. of pearlite; while 50 per cent. pearlite and 50 per cent. ferrite is obtained in a steel containing about 0.43 per cent of carbon. These figures are obtained by getting the carbon percentage from the left hand of the chart and then following a vertical line directly across the chart. It is, of course, understood that only combined carbon is here spoken of.

The ferrite, is carbonless iron; that is, none of the carbon is combined with the iron. The cementite (Fe_3C) is composed of three atoms of iron combined with one atom of carbon; while the pearlite is alternate layers of ferrite and cementite. In hardening steel or tempering it, these constituents can be altered to an extent that will make the cementite 100 per cent. in most of the steels.

The maximum strength of steel is usually obtained with 1.00 per cent. of carbon and this, to a great extent, is due to the fact that the crystalline constituents form an intimate mixture near the eutectoid proportions, and hence the crystallization is comparatively small. With more carbon (cementite) present, the pearlite grains are surrounded with a network of cementite, while with less the pearlite grains are surrounded with a network of ferrite. Both of these decrease the cohesive force inherent in the metal and therefore have a weakening effect.

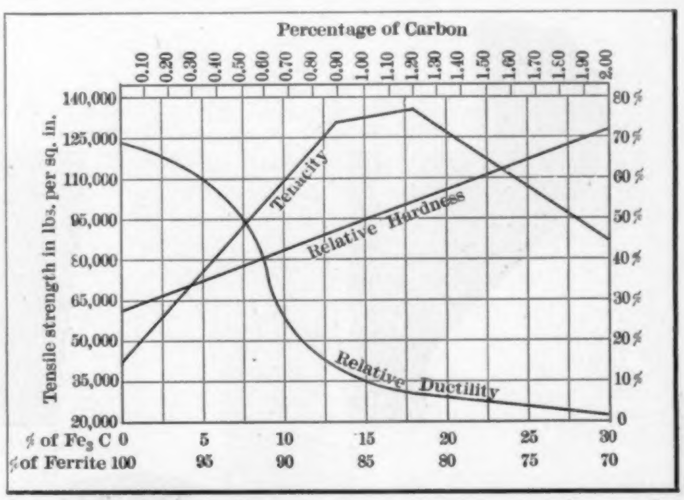


Chart 2—Showing the effect of various percentages of carbon on the physical properties of steel.

What Some Subscribers Want to Know

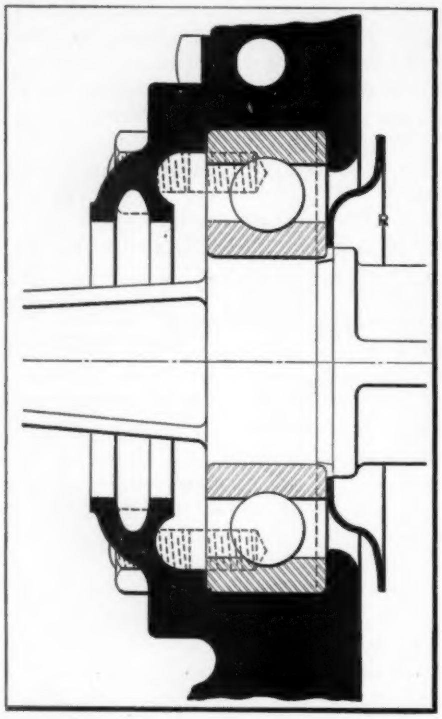


Fig. 1—Showing a dished ring inserted between the bearing and the gear case to prevent oil from running out.

Looking for a Four-Wheel Drive and Street Car

Editor THE AUTOMOBILE:

[2,607]—Can you give me the name and address of the company manufacturing a four-wheel drive automobile that steers with back as well as front wheels; that is, all four wheels swivel. A. G. NEVILLE.

Brooklyn, N. Y.

To Prevent Oil From Leaking Out of Transmission

Editor THE AUTOMOBILE:

[2,608]—I was much interested in your letter with reference to preventing the oil from leaking out of the transmission case through the ball bearings. I would like to know if a curved sheet of metal would answer the purpose. T. R. L.

Portland, Me.

The metal disc shown in Fig. 1 is used on some cars and works well. It has not the advantage of the other type, as it does not prevent particles of metal or dirt from finding their way into the ball bearing, but it should prevent the excessive flow of oil from pouring in the bearings and so oozing out.

Lost Motion Indicates Need of Overhauling

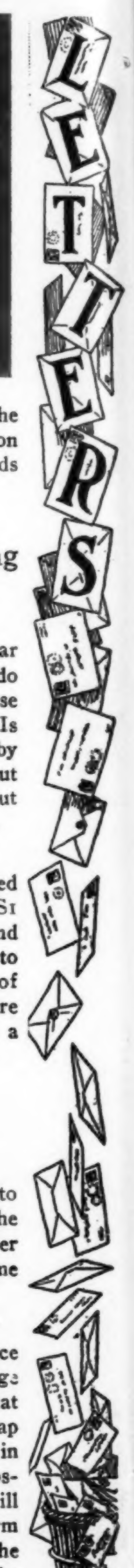
Editor THE AUTOMOBILE:

[2,609]—I have a 1910 model automobile. Lately the hum from the transmission has not been even; it seems to have a skip in it, but does not cause the car to jump; it is more noticeable on high gear than either of the others. I have also had trouble in keeping enough grease in the transmission. Please give the cause of my trouble and show how to overcome it. SUBSCRIBER.

Cisco, Texas.

The indication of lost motion is not sufficient to warrant one in venturing the statement that the gears are not in fair mesh, but there is a chance that when the sliding gear system is thrown into the position designated as "high" that lost motion in the control members is such that the gears do not fairly mesh. This trouble would be accentuated to whatever extent the clashing ends of the teeth of the gears are battered up and worn away. The trouble complained of does not indicate that there is a loose key, for, under such conditions, the skipping would be continuous. The car needs overhauling, and the fact that grease cannot be confined within the transmission case is merely an indication of lack of timely attention to the needs of the car.

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their automobile troubles, stating them briefly, on one side of the paper only, giving as clear a diagnosis as possible in each case, and a sketch, even though it may be rough, for the purpose of aiding the Editor to understand the nature of the difficulty. Each letter will be answered in these columns in the order of its receipt. The name and address of the subscriber must be given, as evidence of good faith.



Preventing Nuts from Backing Off Without Split Pinning

Editor THE AUTOMOBILE:

[2,610]—There are several nuts on my car that have a tendency to back off and I do not care to go to the trouble and expense of taking the shafts out to drill them. Is there any other method of proceeding by placing a set screw at the side of the nut and using a wire wrapt around notches cut in the nut? J. W. NOTT.

Philadelphia.

The method you suggest can be carried out, as shown in Fig. 2. The set screw S1 can be drilled in the manner shown and grooves G cut in the nut for the wire to pass around. If, however, the threads of the screw S1 are more than 21 inches there will be no necessity for the wire as in a No. 14 x 28 screw.

Home-Made Cork Inserts

Editor THE AUTOMOBILE:

[2,611]—I would like to fit cork inserts to the leather-lined clutch of my car. The boss is made of aluminum with the leather riveted thereto. How can I make some bosses for the cork to rest in?

Amboy, N. J. CLUTCHSLIP.

It depends upon the amount of clearance between the boss of the clutch and the flange as to whether you will be able to do what you want. By taking an ordinary gas cap and screwing it into the aluminum boss in the manner shown in Fig. 4 it will be possible to inset the cork therein so that it will protrude through the leather and thus form contact with the female member of the clutch. In your endeavor to increase the co-efficient of friction do not weaken the

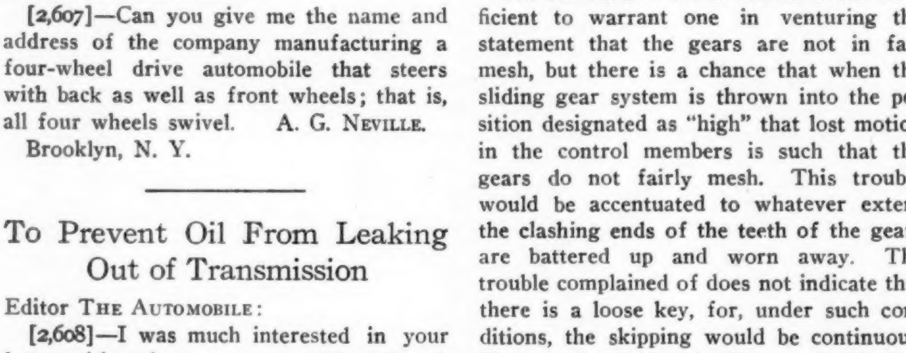


Fig. 2—Showing method of locking a nut that has not been split pinned either by means of a stud or wire attachment

What Other Subscribers Have to Say

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their personal experiences for publication in these columns for the worthy purpose of aiding brother automobilists who may be in need of just the information that this process will afford. Communications should be brief, on one side of the paper only, and clearly put, including a rough sketch when it is possible to do so, and the name and address of the writer should be given as evidence of good faith.

clutch by too much drilling, otherwise the experiment is likely to prove expensive.

Coping with a Mysterious and Persistent Noise

Editor THE AUTOMOBILE:

[2,612]—I have a 4 3-4 bore by 5 1-4 stroke four-cylinder L-head motor which has not been run over 50 miles, and is therefore new. It has a peculiar click inside the combustion chamber similar to tapping the cylinder walls with a hammer, or a valve snapping, caused by too weak a spring. However, the valve springs proved not to be too weak. The noise occurs when the motor is running slow, whether idle or pulling a load, and seemingly only on one cylinder; then, again, it seems to be transferred to another cylinder, then again disappearing entirely. I thought the piston rings were overlapping the valve ports; I therefore took the cylinders off, removing piston ring nearest head on each piston, but with no result. This noise occurs at any position of the spark lever. When it disappeared I tried to produce the noise to find the reason by retarding and advancing spark considerably, but failed to get the same noise; it suddenly disappears and then appears again, proving that it is not due to the spark. The noise does not come from the push rods as there is only a clearance of 0.006 of an inch. I have also disconnected the muffler to be sure there is no back pressure. The bearings and bushings are all in good condition and not loose. The side clearance or wrist-pin bushings is 1-16 of an inch on either side; the compression is 65 pounds per square inch at 300 revolutions per minute, throttle fully opened. I thought the tapered pins might cause the noise, but as it disappears at times with the same pistons, it proves not to be in them. The present pistons are 0.003 of an inch at bottom and 0.006 at top, smaller than bore of cylinder, but I intend putting in straight pistons, with a clearance of 0.004 of an inch less than cylinders, and stepping off a few thousands at the head end. I would appreciate your help very much, as this trouble has annoyed me considerably and may lead to serious results. I cleaned all the spark plugs well and was sure the motor was firing on all four cylinders. This morning the motor ran half an hour without usual noise, but it suddenly started again. The water was heated slightly; I changed the water, but the noise kept on for about fifteen minutes, stopping and appearing again as usual.

Milwaukee, Wis. A. H. GROSS.

It would seem from the description of this motor, considering all the attempts that have been made to eliminate the mysterious noise that creeps in under a variety of conditions, that the noise is due to something entirely beyond the fit or the relations of the moving members. Some time ago an automobilist went through just such an experience, and after he expended a considerable amount of time in investigating and having gone to the cost of replacing the pistons and doing a lot of mechanical work, the noise appeared precisely as before, thus indicating that it was due to some unusual phenomena. In this particular case the noise was discovered by accident. It appears that the automobilist removed the priming cocks from the cylinders and he then discovered that there was a considerable cavity due to the thickness of the wall where the priming cocks were screwed in and to the fact that the threaded portion of the priming cocks was not long enough to fill up this space. The compression of this motor was not quite high enough to afford the best result and the automobilist procured a new set of priming cocks with the threaded portion long enough to extend through the wall, flush with the inside. This, of course, had the effect of increasing the compression of the motor a slight amount, due to the filling in of the cavity by metal, but the strange part of the story lies in the fact that the mysterious noise disappeared and a little further experimentation led to the conclusion that this noise was due to some action that took place in the cavities as above referred to. It will be worth while to examine the cylinders of this motor and to ascertain whether or not there are any cavities formed either by the extensions of the priming cocks being too short or otherwise. The idea is illustrated in Fig. 3, showing an L-type of cylinder with the priming cock C1 screwed into the valve cover and a cavity C2, which is formed due to the thickness of the valve cover and to the fact that the threaded portion of the priming cock is not long enough to pass clear through the wall of the cover.

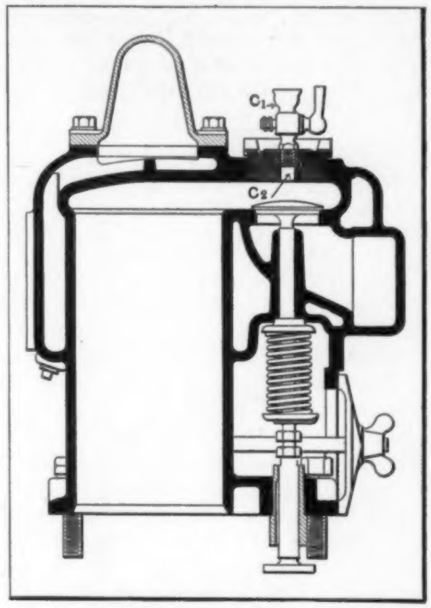


Fig. 3—Section of an L-type cylinder showing a cavity in the valve cover due to the short-threaded portion of the priming cock screwed into into same.

A Queer Case for Solution

Editor THE AUTOMOBILE:

[2,613]—Of two duplicate six-cylinder cars having run 2,500 miles the one has not

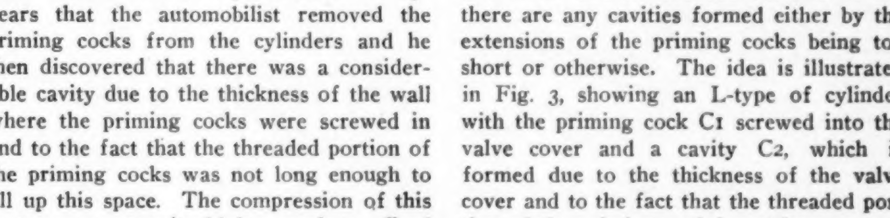


Fig. 4—Method of turning an ordinary leather-faced clutch into one with cork inserts.

required removal of a single spark plug, the other has broken at least a dozen porcelains without other evidence of overheating. Where is the difficulty likely to lie?

A Simple Method of Testing the Firing

Editor THE AUTOMOBILE:

[2,614]—What is the best method of testing the firing of a motor without detaching the wires. NOVICE.

Princeton, N. J.

There are several contrivances on the market for this purpose in the form of spark gaps, trouble finders and cut outs. It is a very simple matter to make these as shown in Fig. 5. By taking a piece of copper tubing a terminal and holder for the bent wire can be formed with the aid of a hammer. The spring will keep the wire either up or down as desired. The knob should be made of vulcanite or fiber for insulating purposes. As shown in the position A the plug is short-circuited and the other plugs can be tested, and in the position B as the attachment should be when not in use.

Having Rough Experience with a Second-Hand Car

Editor THE AUTOMOBILE:

[2,615]—Though I have been a subscriber to THE AUTOMOBILE for less than two months I have already become its fast friend. Will you kindly give me the following information through your "Letters" column:

Last Summer I bought a second-hand car, 16.9 horsepower, air-cooled motor. I ran it three months, less than 600 miles, and had a great deal of trouble with the engine heating and used about twice as much gasoline as I should have used. I have completely dismantled the car and found no sign of carbon in the cylinders, but the rings were loose. I found the muffler (one with discs) completely clogged up.

(a) Could it have gotten in that condition in the time and with the running I gave it, having used the oil recommended by the manufacturer?

(b) What effect would that condition of muffler have on power? What per cent. of loss?

(c) What effect would said condition have on increased gas consumption?

(d) My car, a light five-passenger, is equipped with regular clincher tires, 28 x 3 1-4. I have much difficulty in replacing them (few firms make that size) and in getting equipment such as protectors, etc. Would it be safe and advantageous to use 28 x 3 inch tires?

(e) Would steel prot ctors or treads materially injure the casings and tubes, that is, by increased heating? G. L. F.

Jacksonville, N. Y.

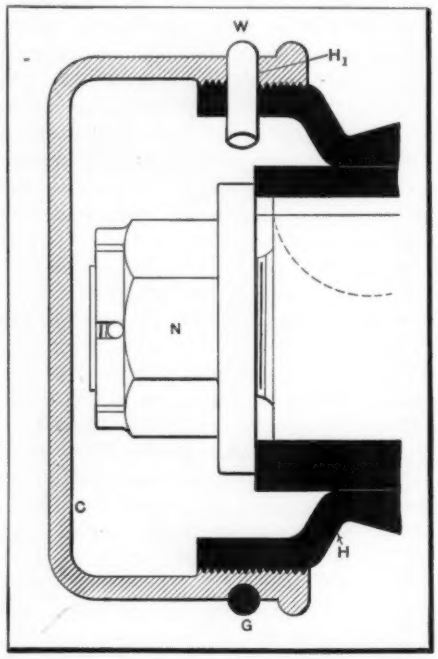


Fig. 6—Showing how a wire ring can be fitted to a hub cap to prevent it backing off

(a) The length of time was sufficient to bring on a bad case of indigestion.

(b) It would not be difficult to imagine that the motor might lose fully half of the power, due to a clogged-up muffler, such as you relate.

(c) The probabilities are that the carbureter was adjusted to give an over-rich mixture. Too much gasoline was being used.

(d) It will be safe to use 28 x 3-inch tires. An economy will result if this larger size is adopted.

(e) If you put on 28 x 3-inch tires you will not have to resort to the use of steel shoes. It is a dangerous proceeding to use metal protectors, excepting under carefully regulated conditions.

It is not strange that you should find the motor free from carbon accumulations; the condition of heating would indicate that the carbon would be burned up, but it is believed that you would obtain very much better results were you to so regulate the carbureter that the amount of gasoline would barely suffice to keep the motor running at its lowest possible speed, without load, and then regulate the auxiliary air valve so that the motor would pull satisfactorily at its highest working speed.

It is a good venture to suggest that yo ignition system is none too efficacious. Maintain the ignition equipment in the best possible shape and half of the trouble of which you complain will disappear at once.

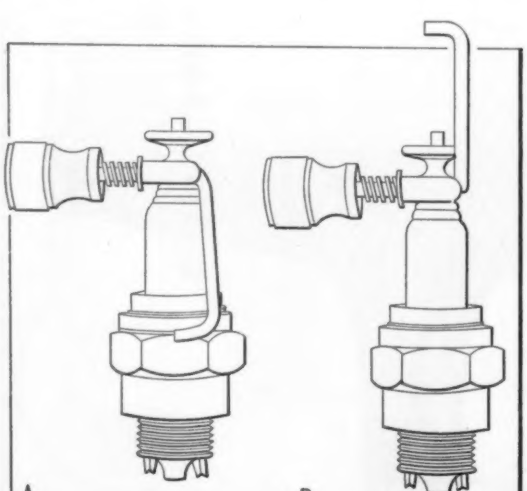


Fig. 5—How a trouble finder can be made with a piece of copper tube and wire.

The Reason for the Loss of Hub Caps and Two Remedies

Editor THE AUTOMOBILE:

[2,616]—Having bought a new car recently I have been puzzled to find out the cause of the loss of two hub caps. After I received the car I went over it carefully and filled the caps with grease and tightened them up as much as possible, standing on the cap spanner to get a good leverage. I should be glad to have your advice on the matter. ANNOYED.

Springfield, L. I.

The method you employed for tightening is very good in its way, but it depends upon the type of cap fitted to your car as to whether it answered any more to tighten in the manner you adopted than tightening by hand. Referring to Figs. 6 and 7, two types of caps are shown. In Fig. 6 there is no provision to keep the caps on unless as therein shown a wire ring is fitted. This is a simple matter that any blacksmith can do. With such a ring it is impossible to lose the cap. In Fig. 7 there is no provision necessary, as the cap shoulders up against the hub proper and this contact is sufficient to prevent the cap from loosening if it is tightened properly in the first place.

Study Principles, Not Plans of Aeroplanes

Editor THE AUTOMOBILE:

[2,617]—Are there any of your journals which contain cuts and detailed information of a Curtiss and Wright aeroplane, or of either? If you do not have the desired copies will you kindly inform me as to where I may obtain the above data? W. N.

Toledo, Ohio.

THE AUTOMOBILE has never presented scale drawings of a Curtiss or a Wright biplane. *Aeronautics* of New York, which may be obtained through newsdealers, and *Der Motorwagen*, a German journal, which may be ordered through the International News Company, of New York, 73 Duane street, have both offered scale drawings, for the data and accuracy of which we cannot vouch, however. Very vital points in the design of aeroplane machines are changed from one week to the next. The

changes are mostly inconspicuous ones. Some relate to the balance of the structure and could not be properly shown in drawings or description; others to the curvature of planes whose value is closely bound up with minute variations of shapes. The relations between weights, shapes and areas are subject to modifications according to the efficiency of the motor and the propeller. A successful aeroplane can only be built through an understanding of these principles. Mere imitation leads to waste of effort and disaster, as the factors in construction which produce fairly safe flight are strongly interdependent and no possibility exists for getting complete and reliable, up-to-date information on all points. The little improvements which bear on equilibrium are usually kept secret as long as possible and the designers are much in the dark themselves with regard to the effects of details. Consider, for example, that the Wrights have only recently abandoned their front elevating rudders, for years the most conspicuous feature of their construction, and that Curtiss frequently changes the curves of his biplanes and has built a monoplane which looks very attractive indeed to the beholder. Anybody with ordinary mechanical sense and understanding of the principles can build an aeroplane, either biplane or a monoplane, which will fly, provided he secures a suitable motor and propeller, but its safety will depend on a certain proportionateness throughout, which can only be learned from experience. Furthermore, no existing aeroplane is even approximately safe. Plans of their construction in THE AUTOMOBILE would support the fallacy which ascribes a permanent value to their design.

The Principles Are Diametrically Opposite

Editor THE AUTOMOBILE:

[2,618]—Will you kindly favor a subscriber by explaining the difference between a full-floating rear axle, and a semi-floating rear axle.

FRED D. CLARK.

Plattsburgh, N. Y.

In a full-floating type of rear axle, the jackshaft is subject to torsion only. In the other kind, torsion, bending moment, and compression are entertained.

Stout and Serviceable Wheels Are Made in This Way

Editor THE AUTOMOBILE:

[2,619]—Is there merit or virtue in having front wheels dished or leaning in at the bottom and out at the top?

CONSTANT READER.

New York City, N. Y.

There are three considerations involved in this question.

(a) The weight of the car should be carried on plumb spokes.

(b) The wheels should be dished to give them strength, it being the case that with dished wheels all of the spokes are in compression, which, for wood, is the best possible condition.

(c) The camber of the road makes it necessary to arch the axle so that the plane

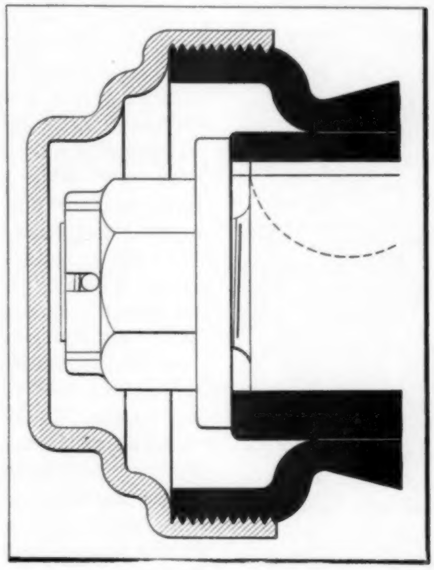


Fig. 7—Type of hub cap that will not back off, as the shouldering effect against the hub will prevent it.

of the wheel will be at right angles to the plane of the road at the point of contact.

Wants to Know Action of Four-Cycle Motor

Editor THE AUTOMOBILE:

[2,620]—I am a reader of THE AUTOMOBILE. Will you please answer the following question? What is the action of a four-cycle motor?

Willard, N. Y. W. E. SEELY.

Your question is somewhat ambiguous and can be answered in a few words to one who understands anything of an automobile, but would take several pages to describe to the novice who has no knowledge at all of motors. A piston attached to a crankshaft by means of a connecting rod works up and down inside a cylinder and as there are four cycles to be accomplished it works up and down twice to complete the four cycles. First, with the intake valve open on the downward stroke it sucks in a combustible gas mixed in the carbureter and when the piston is near the bottom of the stroke the valve closes and the return stroke upwards compresses the gas in the cylinder. At a given point of its travel a spark takes place in the cylinder and the gases are exploded and the piston is forced down and at the bottom of the stroke the exhaust valve opens and allows the burnt or exploded gases to escape when the piston comes up on the fourth stroke. The intake valve then opens again and the engine starts on a repetition of the foregoing cycles.

Plan Does Not Offer Good Promise

Editor THE AUTOMOBILE:

[2,621]—Can you tell me of some successful means of making a water-cooled rotary gas valve tight against the escape of the expanding gases? Are choke grooves sufficient for the purpose? The valve is about three inches in diameter and revolves at half the speed of the crankshaft. What should be the character of the fit, or how many thousandths smaller should the valve be than the chamber? VALVE.

Plainfield, N. J.

It is highly improbable that the valve as described can be made tight under the varying conditions of temperature that have to be coped with in the operation of an internal combustion motor.

A Reader's Idea of Getting Rid of Burned Gas in a Two-Cycle Motor

Editor THE AUTOMOBILE:

[2,622]—I enclose sketches (Fig. 8) of my idea of getting burned gas out of the top of the cylinder head of a two-cycle engine. I have been told by a patent attorney that it is doubtful if I could obtain a patent on same. I have never seen anything like it before.

FRANK P. REIDHAAR.

Connersville, Ind.

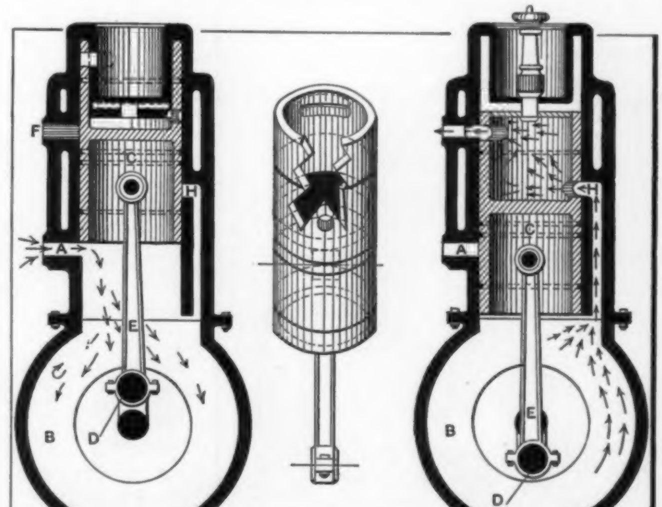


Fig. 8—Three sectional views showing how a reader of "The Automobile" proposes to expel burned gases from the top of the cylinder head of a two-cycle motor.

Tires and Effect of Underinflation

Question Viewed from the Point of Contact Area

A moment's thought will make it apparent to any one that if a tire is inflated to the proper pressure the amount of road contact will be decreased. By decreasing the amount of contact considerable saving in wear will be effected.

THE tire problem has been viewed from the point of underinflation from time to time and the different writers have shown that with tires improperly inflated that there is a great amount of side pulling on the walls which are the body of the tire. This is too apparent to need elaboration; suffice it to say that the first care of the autoist should be to see that the size of tire he has fitted to his car or in the case of the purchase of the new car that the section should be sufficient to support the weight of the car. It is not possible to prevent flexure which in other words means bulging at the point of contact with the road surface if the tire is not in proper proportion to the superimposed weight.

Taking for granted that the car is fitted with the correct size tires it is then a question to obtain as much mileage out of a set of tires as possible and it is proposed to show by means of diagrams that unless the most vital point, viz., inflation, is given attention that wear will increase in direct proportion to the amount of underinflation that exists. There is hardly any one owning or operating an automobile that does not feel that he is not getting all he should out of his tires. The makers guarantee of a few thousand miles is a minimum that the tire should last and not a maximum as some people think. Of course road conditions play a big part in the question of upkeep and it remains for the autoist to solve the question of the choice of tire most suited for a particular locality for himself by a series of experiments and the experiences of his friends. These experiences, however, are not always an infallible guide because the manner the car is driven and the proportion of size of tire to the weight of car must be borne in mind. But it is safe to make the deduction that if a certain car can be driven over a given set of roads and the tires last say 5,000 miles another car of the same make should be able to equal the performance under the same conditions, provided the wheels are in good alignment. If they do not, then the driver is at fault or the tires are not properly inflated.

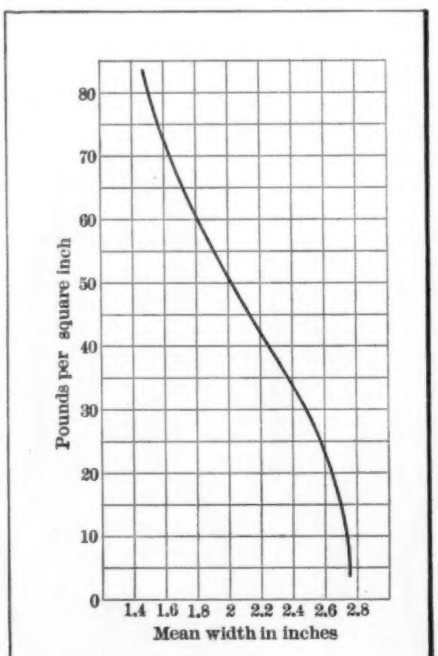


Fig. 1—Curve showing the mean width of contact with the road surface of a 34x4 tire at different pressures

In some recent tests carried out by THE AUTOMOBILE impressions of a 34 x 4 tire were taken and the results of the amount of contact area and width of superficial contact while the car was standing still are shown in the curves 1, 2 and 3. If these were taken while the car is running no doubt the difference would be more pronounced, especially on the driving wheels, which every one knows wear out quicker than the front tires. Besides the flexure due to the weight of the car there is the thrust of the driving forces that tend to still further flatten the tire in propelling the car.

Considering Figs. 1 and 2 together the widest parts of the point of contact and the mean width of the part of the tire that touches the ground will be seen. These curves consider width alone, but are sufficiently striking to show how much the tire spreads out when the pressure is low. At 50 pounds pressure the mean width is equal to the greatest width, but as the pressure is increased the mean width takes smaller proportions to the actual greatest width. It is well to consider for a moment the length of the contact, and the following table is taken from the impressions that were taken with a tire of 34 x 4 dimensions:

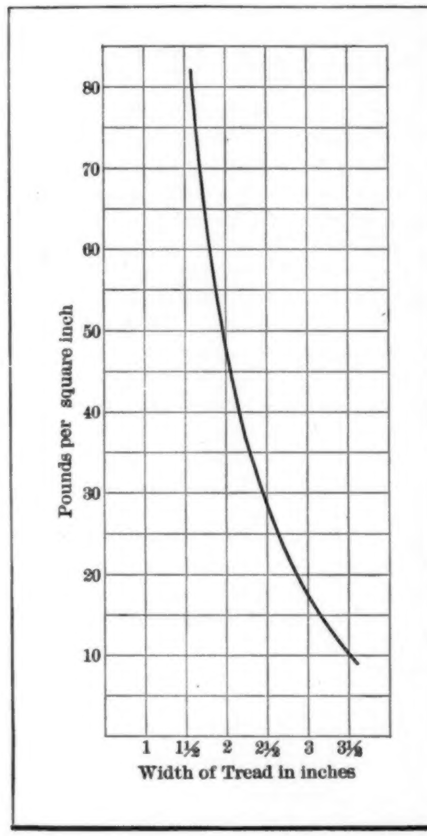


Fig. 2—Curve showing the maximum width of tire surface in contact with the road at different pressures.

Tire Inflated to Pounds Per Square Inch.	Length in Inches of Tire in Contact With the Road Surface
80	6½
70	7¼
60	7⅞
50	8¾
40	9⅞
30	10⅞
20	11½
10	12

There is one great error that autoists are liable to fall into and that is to assume the pressure in their tires is sufficient and the method of gauging this pressure is by jumping on the hub cap or giving the tire a kick. This method of testing pressure is useless and there is only one way that is infallible and that is to put a reliable gauge on the tire independent of a pump.

The area of contact as shown in Fig. 3 clearly demonstrates that the effect of underinflation must necessarily bring with it short life. In a tour through several garages in the city of New York it was found that the average pressure in tires

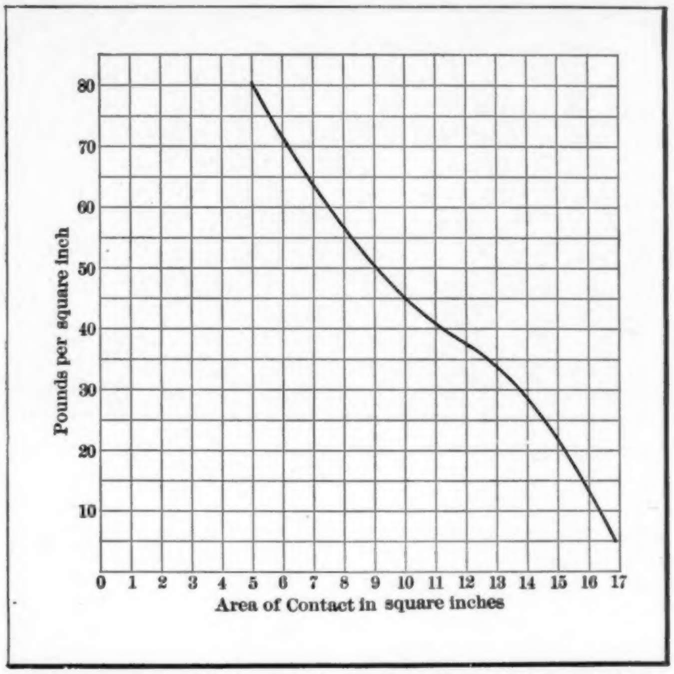


Fig. 3—Curve showing the amount of contact of the tire in square inches in contact with the road surface at different pressures. It is well worth noting that the amount of contact is decreased by half when the pressure is increased from 40 to 80 pounds per square inch.

was below 40 pounds per square inch and for a tire to be inflated to 50 pounds or over was a rarity. The solution of the problem is to save labor and equip the car with some mechanical means of inflation which can be used at any given moment as soon as the tires show signs of falling below the standard. There seems to be a difference of opinion between tire makers as to what these standards should be but if the tires are inflated to the maximum that they will take they will last infinitely longer than if allowed to jog along like a consumptive. The fact of the matter is that the small amount of extra trouble entailed is too much for some while others do not seem to appreciate that it is as necessary to fill the tire with air which costs nothing as it is to fill the lubricator. The only difference is that without oil the car would refuse to go at all and would cost money to repair if it froze. The tire is a silent sufferer and the autoist instead of trying to help matters tries to put the blame on the tires.

When the Radiator Becomes Clogged—To clean a honeycomb radiator of sediment the following method is recommended in preference to the use of a jet of steam. Prepare a 10 per cent. solution of potash. Heat it. When the boiling point is just reached pour it into the radiator after closing the pipes which in service lead to and from the motor. Stir every hour for 12 hours by turning the radiator upside down. Pour the solution out by way of the same opening at which it was poured in. Screw a hose with water under pressure into the opening at the opposite end and run a stream through for a few minutes.

Speed Eats Up Gasoline Rapidly—It is not always the case that the most fuel is used on the very inferior road, since a car at a high rate of speed might burn up more gasoline on a good road than would be used by a car at a low rate of speed on a road not so good.

How to Study the Magneto

Using the Pittsfield as an Illustration

Every owner or driver of an automobile should master the principles of the electrical system of his car and know the different tests to apply in case of breakdown. Sometimes a small thing may place the car out of commission, which, if the owner knew how to remedy it, would save him considerable trouble.

When the happy possessor of a car brings his prize home for the first time he takes a keen interest in going over the car in detail and studying its different working parts. Some of the operations are simple and require no great extent of mechanical knowledge to master and others become clearer each day as the owner operates the car. The magneto, however, seems to be a part that works and beyond an occasional oiling receives little attention. As a matter of fact this is a good thing, as the more the magneto is fussed with the less likely it is to operate in a reliable manner. But there comes a time when the brushes need cleaning and the contact screws may require adjustment. It is well to know how to effect these minor operations when the time arrives, but it is better still to become acquainted with the mechanism of the entire source of current.

It is not necessary to take the magneto to pieces to effect this, but by studying a diagram the operation and relation of the working parts can be mastered. The type of magneto shown in Fig. 1 is made by the Pittsfield Spark Coil Company, is of the high-tension type, but instead of having the primary and secondary

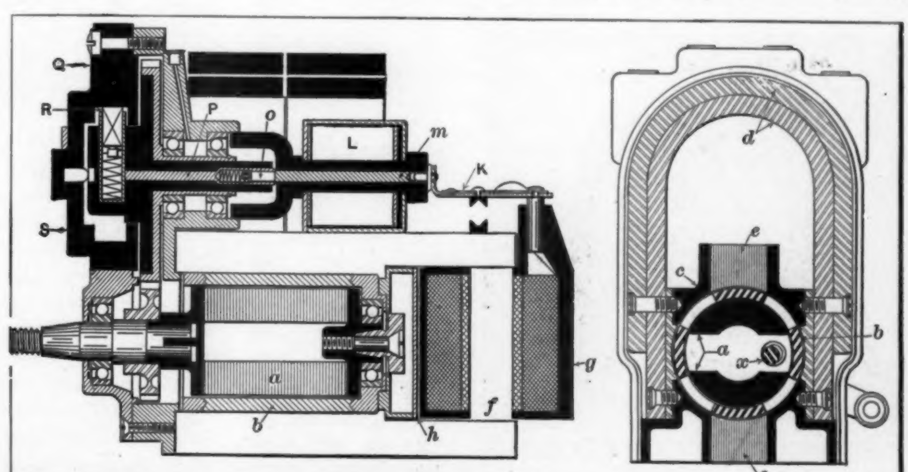


Fig. 1—Two sectional views of the Pittsfield Magneto, showing the relation of the different parts and the coil separate from the armature.

windings of the coil wound around the armature, as is the case in most high-tension magnetos, it is carried at the rear of the armature and contact breaker and is stationary. This is shown clearly in Fig. 2.

Referring to Fig. 1, the armature A will be seen; this is driven off half-time gearing and revolves in the magnetic field C. The field is comprised of four poles, two of which are the poles of the permanent magnets D, and the others are E, together with the iron core F of the coil. The rotation of the armature in the field generates in the winding of the coil G, an alternating current which, during each revolution of the armature, attains a maximum four times, which means that for each 90 per cent. rotation of the armature an ignition may be obtained. There is no necessity to use these four sparks, as in the case in point only two are used, the flywheel having to make two complete revolutions for the four cycles.

As will be seen the armature is run on ball bearings which require little attention and carries at the driven end a gear wheel that operates the distributor, which will be considered later, and at the other a cam for operating the make-and-break device. Both the primary and secondary windings are located in the stationary coil shown in Fig. 9, which can be removed by disconnecting the wires and freeing the catch B. It is wound with a few turns of heavy wire in the primary winding and many turns of fine wire in the secondary. The coil will be seen in section in Fig. 1 at F and one end of the primary winding is connected to the field by contact and the other to the contact plate P which is screwed to the field insulated by hard-rubber plate and bushings. From this plate a brass contact piece B1 makes a connection to the platinum contact piece I in Fig. 9 and the platinum screw of the interrupter which is located behind the coil and access to which is obtained by removing the coil as above described. The contact piece is insulated from the interrupter plate which is in metallic connection with the field or ground. The contact breaker is of the conventional type in which a platinum screw held in contact with the fixed platinum screw by means of a spring is attached to a lever which is caused to oscillate by contact with the cam at the end of the armature shaft. The current generated in the primary winding is short-circuited as long as the two platinum screws are in contact, as the lever is in metallic connection with the field. At the end of the lever there is a hard fiber cam which insulates the lever from the armature and when the cam lifts the lever the current is instantly interrupted. A condenser L protected by a housing is connected in parallel to the interruption of the platinum points.

The secondary winding is connected to the end of the primary winding at one end and the other leads to the conductor M in Fig. 1 by a metal bridge K. The secondary or high-tension current is conducted to the distributing brush R through the bridge K by means of conductors M and P, which are insulated from the metal parts of the magneto, the connection between these last two being made by the spring and carbon brush O. The distributor plate has four metallic inserts set at 90 degrees and these are connected to the spark plugs by means of high-tension cables. The high-tension current is carried as before stated to the carbon brush R which is caused to revolve by means of gearing. The gear is in two to one relation to the driving pinion on the armature shaft and is attached to a shaft which runs on ball bearings, so that for every two revolutions of the armature shaft the carbon brush R makes one complete revolution. As the brush R passes over the metal inserts it transmits the high-tension current. The distributor plate can be seen at A in Fig. 2; it is fitted with a removable cover C, the bar B serving to hold it in place. By removing the cover the contact pieces or inserts as well as the carbon brush can be inspected and cleaned. It also offers a ready means for inspection as to which cylinder is about to fire and in case the magneto requires removal a certain method of replacing same in position. By turning the motor so that one of the cylinders is on the dead center after compressing and rotating the armature of the magneto so that the line on the brush holder is

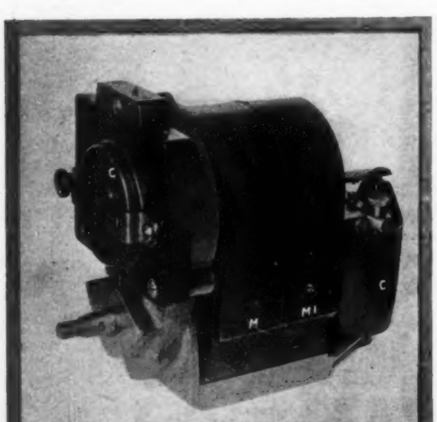


Fig. 2—General view of the Pittsfield Magneto seen from the driven end

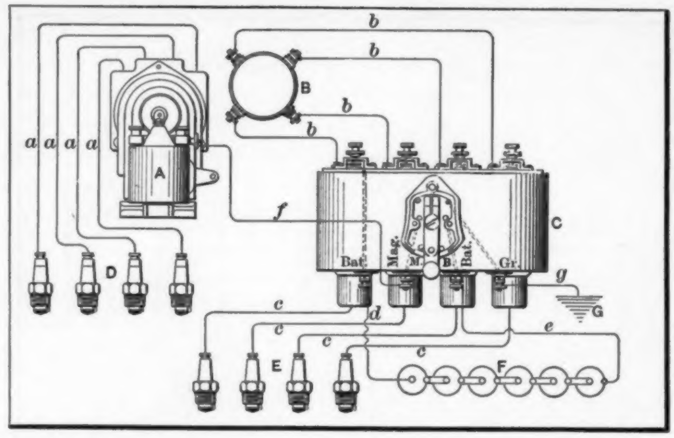


Fig. 3—Wiring diagram of the Pittsfield Magneto with independent coil and set of batteries.

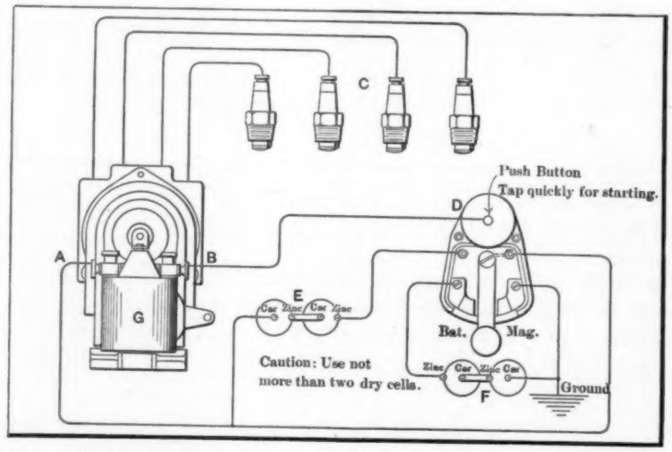


Fig. 4—Wiring diagram of the magneto using dry cells for starting and emergency purposes.

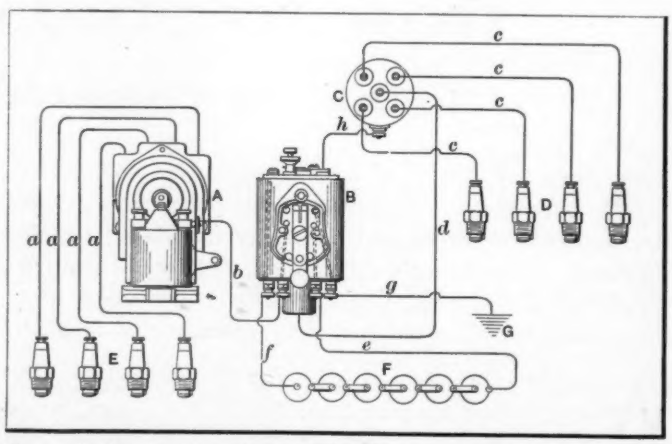


Fig. 5—Wiring diagram using a single vibrator coil and independent distributor to two sets of plugs.

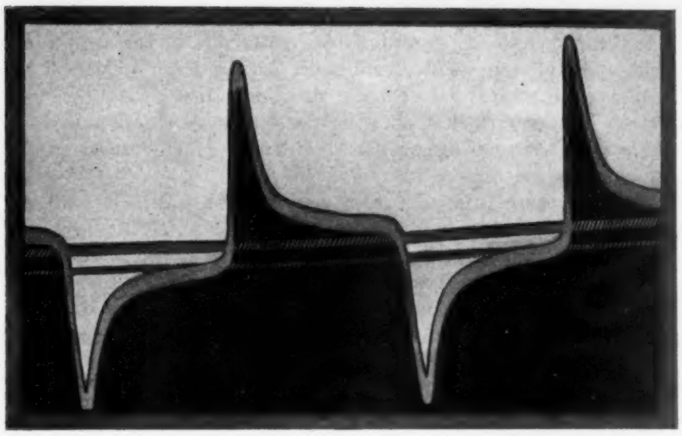


Fig. 6—Voltage wave of alternating characteristic of the saw-tooth variety somewhat conventional in magneto work

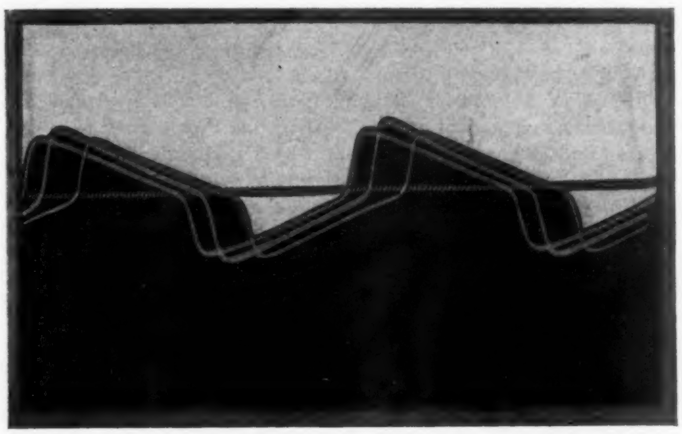


Fig. 7—Superimposed waves showing the lagging relation and other evidences characteristic of small alternating current generators.

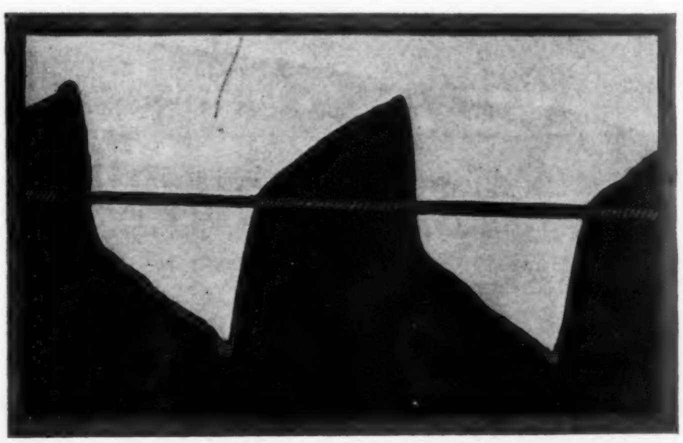


Fig. 8—Current wave of the alternating saw-tooth form resultant of the voltage wave as shown in Fig. 6

directly under the line on the distributor plate it is possible to replace the magneto and be sure that the firing will be correct if the wires are properly connected to the different plugs. The alteration of timing is effected by raising or lowering the lever L in Fig. 9, which changes the position of the field poles by means of the sleeve B in Fig. 1 to which the interrupter is attached. By this means the same efficiency of spark can be obtained in the advance or retard position, making starting on the retard an easy matter and doing away entirely with the danger of back kick of the motor.

A spark gap G is fitted as seen in Fig. 9, which allows the current to escape in case one of the plugs is out of order and go to earth. To short circuit the magneto a wire is fitted to terminal on the rear of the magneto.

The wiring diagrams in Figs. 3, 4 and 5 show the different methods of wiring when a dual system is desired.

Wave Forms of Voltage and Current with Alternating Characteristics Are Not the Same in a Magneto as in a Dynamo-Electric Machine

Those who have given a measure of attention to the shapes of the waves of electromotive force and the resultant current generated in dynamo-electric machines have found it advantageous to adhere to the sine form of wave as generated in a well-contrived machine, but in a magneto, instead of obtaining the full and regular sweep characteristic of the sine wave, the forms of voltage and current waves are more in keeping with Fig. 6 for the voltage and Fig. 8 for the current, whereas Fig. 7 shows the superimposing of waves, affording an insight of the lagging of one behind the other in the regular course. These waves are not identical in the respective makes of magnetos any more than they would be in the various designs of dynamo-electric machines. Referring to dynamos, while it is true that a preference is given to the sine form of wave, very few if any of them deliver current on a basis of precision in this regard. Referring to magnetos, departure from a fixed form of the voltage and current waves is more marked, due to the fact that the magnetos are relatively small, hence difficult to make in conformity with the rather obscure laws that govern wave forms. Moreover, as practice would seem to indicate, the abrupt reaching up of the voltage line, if it is accompanied by a somewhat full current component, is advantageous. The great question in ignition work is to have the spark definitely controlled as to time, and having accomplished this task it remains to realize the maximum energy component. These curves seem to match up to the fitting requirement.

Car Needs Light and Air

Body varnish is disastrously affected by a lack of pure, fresh air and plenty of light—it becomes green, spotty and discolored from too close confinement.

Pure, fresh air brought into the storage quarters of the automobile in a quantity sufficient to counteract the accumulating foul air, fetid odors and gases will prevent varnish spotting and loss of luster. It is a feature of economy in which the garage manager and automobile owner should alike be vitally interested.

Complaint on the part of owners and users of automobiles painted in dark colors is widespread concerning the greening and discoloration of the varnish, thus destroying to a greater or less extent the natural attractiveness of the colors and combinations of colors employed. This is due, for the most part, to the too close confinement of the automobile in an insufficiently lighted room. A lack of light affects the varnish disastrously, and in greening and discoloring it the color over which it is used is likewise injured, if not rendered absolutely useless. This emphasizes the need of light to preserve the original and native quality of the finish.

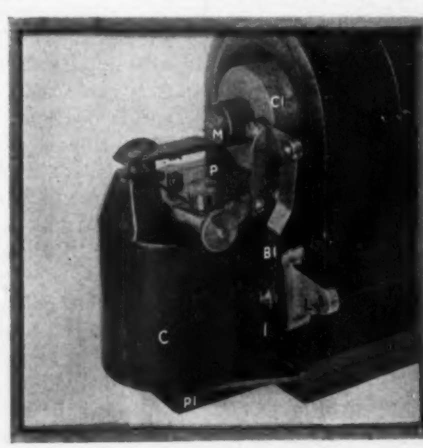


Fig. 9.—Rear-end view of the Pittsfield Magneto showing the coil carrying the primary and secondary windings.

How Solid Fuel Is Made

In the "Automobile Owner" (English) W. H. E. Humphreys tells something about the making of solid gasoline, stating the process in some detail, making observations as to the limitations, and reflecting the future possibilities of this most interesting product, in which mutton fat is destined to play a part.

"IN response to my request," says the author, "I was given a slice in an envelope," referring to the solid gasoline with which the experiments were made to find out what the product was made of and how it was compounded. The author goes on to say:

"Now, as to the process of manufacture, I was fortunate in being able to learn something of this. Put briefly, it is explained the petrol is mixed with a small amount of sterine which has first been treated with hydrochloric acid. To this mixture is added a mixture of methylated alcohol which has first been treated with sodium hydrate. The two liquids are stated to unite with considerable energy and, after the addition of water, the gelatinous mass results.

"It is claimed that the petrol so treated is far safer to handle than in the liquid condition, and no doubt this is so, for as jelly the activities of the petrol seem to a certain extent to be suspended. Thrown in the fire, the jelly burns very little fiercer than candle grease. I am told that, after exposure for 3 1-4 hours in a laboratory, the loss by evaporation was about 44 per cent., but one would think that this rate is more than sufficient to be dangerous.

"From the chemical point of view a consideration of the process of manufacture is interesting as enabling one to form an opinion as to whether the so-called solid petrol is petrol at all, and if so, whence and how is the jelly derived. Perhaps I can best throw light upon the subject by describing a simple experiment any automobile owner with taste for chemistry can perform. Let us take, for example, about 9 cubic centimeters of petrol in a test tube and add, say, 1 cubic centimeter of powdered stearine. No action results, for the stearine does not dissolve in the cold petrol. Let us now heat up some water in a saucepan, and when the water is simmering, *i. e.*, at about 160 degrees Fahrenheit, let us immerse the bottom of the test tube in the water and move it about in there so as to convey that temperature to is contents. The stearine will be found to have dissolved and the petrol will become clear. Now what have we? Merely a solution of stearine in one of its most suitable solvents, and if we leave for a little time the solution just obtained, the stearine will come down as a hard, gritty precipitate as the petrol cools.

"If, however, while the solution is still hot, we add a little caustic potash, there is an immediate and heavy deposit of a white opaque gelatinous nature. If, however, the caustic potash is dissolved in alcohol and then added hot, the deposit comes down only as the solution cools, and is increased by the presence of a few drops of water, but in that case is not so clear and is more opaque. By holding the test tube horizontally and rolling it round the gelatinous mass deposits upon the sides of the tube, and may be scraped off and allowed to dry on blotting paper. This, I take it, is the solid petrol.

"But what is it really? The addition of the caustic potash has produced a saponification of the stearine, with formation of stearic acid as the opaque deposit which is dissolved in the hot alcohol, but comes down as a gelatinous mass on slow cooling. One may collect the whole gelatinous mass and retain it, and I suggest that it will be found identical in every way with the so-called solid petrol.

"Of course, the above experiment is only a rough one, performed without particular regard to quantities. The jelly will in this case be quite white, instead of brownish tint as in the commercial product, where methylated spirit and mutton fat can be used more cheaply, mutton suet consisting chiefly of stearine.

Digest of the Leading Foreign Papers

Matter that is taken from foreign publications, selected for its value to the engineer, allowing that ideas that are well known in American practice will scarcely be worth recording in view of the value of space.

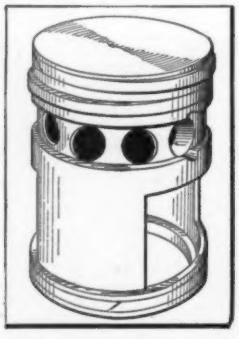


Fig. 1—Malleable iron piston machined inside and out, cross drilled for lightness

LIGHT FORM OF PISTON—The sketch of a piston shown in Fig. 1 gives a good instance of what can be done with modern materials and methods. It is made of a special malleable iron and is machined inside and out. The extra ring at the base will be noted. This is accommodated in a shoulder between which and the gudgeon pin lugs the trunk is of very light section indeed. Such a piston only a few years ago would have been regarded as suitable only for racing work and would very probably have been deprecated even for that purpose; yet it is more than amply strong enough for its work and the increased life, as well as liveliness, which follows the use of such a light form of piston thoroughly justifies the extra work entailed in its manufacture.—*The Autocar.*

WORM CHANGE-SPEED GEARING.—The gear illustrated in Figs. 3 and 4 is mounted upon and forms part of the back axle; it provides a direct drive on all three forward speeds and also on the reverse. The driving shaft carries a worm pinion A, which meshes with the second and third speed wheels, marked respectively 2 and 3. The driving shaft also carries a pinion B, which meshes with the first speed wheel and another pinion C, which gears with the back of the reverse wheel R. It will be understood that all the driven worm wheels revolve freely on the differential casing, and any one can be clutched thereto by means of sliding clutch members D E F. It will be seen that there is no relative motion between any worm wheel and its bearing parts when it is transmitting power.—*The Automobile Engineer.*

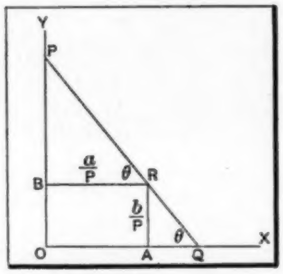


Fig. 2—Method of determining the pitch of spiral gears.

SPIRAL GEARING CALCULATIONS—It is common knowledge that the use of spiral and worm gears in automobile work is increasing, for these are now largely used for fan, pump, magneto, and camshaft drives, as well as for the final drive on the back axle.

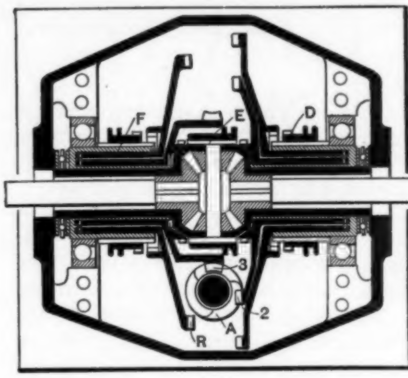


Fig. 3—Cross sectional view of a worm change speed gear mounted on the rear axle.

Yet there are few text books dealing with the subject, and none of the usual pocket books give any help to the designer in laying out spiral gears. One of the chief difficulties encountered is the calculation of correct gears to work in between shafts, the relative positions of which are fixed. And the following method has been used by the writer in laying out such gears.

If a and b are the numbers of teeth in a pair of spiral gears, P the diametral normal pitch, θ the angle of the teeth of "a" to the axis; ϕ the angle of the teeth of "b" to the axis:

Then by the usual formula.

$$\text{Diameter of pitch line of a} = \frac{a}{P\cos\theta}.$$

$$\text{Diameter of pitch line of b} = \frac{b}{P\cos\phi}.$$

If the shafts are at right angles, $\cos\phi = \sin\theta$ and the distance between the shafts is half the sum of the pitch diameters.

$$D = \frac{1}{2}\left\{\frac{a}{P\cos\theta} + \frac{b}{P\sin\theta}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

for any given value of a, b, and P. D will vary from infinity, when $\theta = 0°$, through a minimum value and up to infinity, when $\theta = 90°$. By differentiating we get

$$\frac{dD}{d\theta} = \frac{1}{2P}\left(\frac{a\sin\theta}{\cos^2\theta} - \frac{b\cos\theta}{\sin^2\theta}\right)$$

and equating this to zero we find

$$a\sin^3\theta = b\cos^3\theta$$

$$\tan\theta = \sqrt[3]{\frac{b}{a}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

This gives us the angle which will give the minimum distance between centers for any given ratio, if the pitch is constant, or the largest pitch, if the ratio and number of teeth is constant.

As the distance D passes from infinity to a minimum and back to infinity again it follows that if D is not the minimum value there are two values of θ for each value of D, so that every spiral gear has a complimentary gear with the same numbers of teeth, the same pitch, and the same shaft centers, but with a different angle of teeth and diameter of gears. The two values of θ lie on opposite sides of the angle for minimum distance (2).

There is no simple solution to the equation (1), except the graphic method which is founded on the following theorem, in which the case is at first confined to instances where the axes of the gears are at right angles.

OX and OY in Fig. I. are drawn at right angles, and points A and B are marked, so that $OA = \frac{a}{P}$ and $OB = \frac{b}{P}$

If a straight line be drawn through R to meet OX and OY in Q and P then $PR = \frac{a}{P\cos\theta}$ and $RQ = \frac{b}{P\sin\theta}$

Whence

$$PQ = \frac{a}{P\cos\theta} + \frac{b}{P\sin\theta} = 2\,D.$$

The application is as follows: — Suppose a gear ratio of two to one is required between two shafts, three inches apart, using 8P diametral normal pitch. Then, referring to Fig. II, draw OX and OY at right angles, and draw OC,

$$\tan COX = \frac{b}{a} = \tfrac{1}{2}.$$

Along OY set off

$$\text{spaces} = \frac{1}{P} = \tfrac{1}{8}\text{ in.}$$

apart. Draw lines at right angles to OY to cut OC. Draw a line $= 2D = 6$ in. long on a strip of celluloid or marked off on a straight edge, and slide the ends of the line on OX and OY until the line passes through the intersection of OC and one of the parallel lines. There will be two lines UV through each intersection from O up to the limiting number of teeth, which in this case is twelve. The distance QV is the diameter of wheel b, the distance QU is the diameter of wheel a, and θ is the angle of teeth on wheel a.

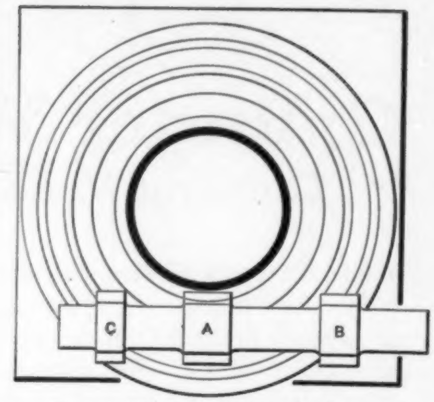


Fig. 4—Side elevation of the worm change gear, showing three worms carried on the same shaft

The number of teeth in b is the number of pitches up to the point of intersection. The most suitable gear for the circumstances can be selected by inspection of its angle and diameters without any calculation.

If the diagram is made to a sufficiently large scale, the angles will be within 20 minutes of the correct size, thus reducing the field when the final calculation is required for detailing the gears.

If the module is used instead of $\frac{1}{P}$ the results will be in millimeters.

If the worm is to be cut in a lathe and has a pitch of L inches, then the line UV must be marked off with distances $= \frac{L}{\pi}$ measured from V, if a is the worm, and from U if b is the worm, the lines being drawn when U and V are on the lines OX, OY, and one of the divisions of UV is on OC.—From an article by J. L. Milligan, in *The Automobile Engineer* of February, 1911.

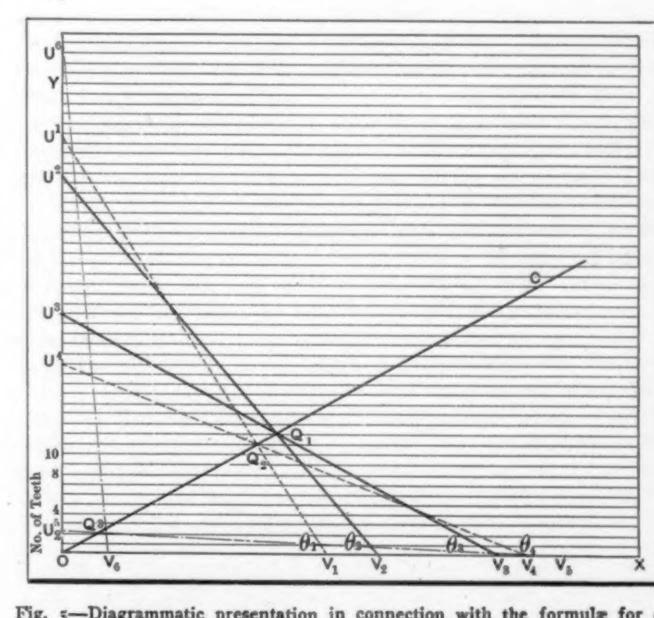


Fig. 5—Diagrammatic presentation in connection with the formulæ for determining the proportions of the teeth of spiral gears.

Cylinder Walls and Motor Efficiency

Cooling Problems Discussed by French Experts

In internal combustion engines, and, in fact, in all thermic engines, a large proportion of heat produced is dissipated in various ways, preventing it from being fully utilized. This article from the pen of F. Carlès, which appeared originally in La Technique Automobile et Aerienne, deals with thermic losses as they occur through the cylinder walls and compares the various types of motors in this respect.

INTERNAL combustion motors, in a similar manner to all thermic machines, work along the same path, viz., that of turning heat into power. Experience, however, teaches one that this cannot be done completely, as a large part of the heat that is furnished is lost and expelled into the atmosphere in the form of non-transformed heat, an example of which is seen in the gas that passes out of the exhaust and the heat that is lost in the walls of the cylinders.

The loss of calories* through the walls is due to the type of cycle adopted, which necessitates opening the exhaust valve before the explosion stroke is completed. This loss could be considerably diminished by adopting another cycle than the Beau de Rochas, as, for example, a cycle with four or three unequal periods. But the Beau de Rochas cycle offers so many constructional advantages that it has not been possible up to the present to supplant it.

These losses by the exhaust are more or less inevitable and can only be prevented by one known method, and that is by using weak mixtures at high compression. But even in this there are limitations.

The only method of increasing the power at first glance seems to be to stop the loss of calories through the walls. It is admitted by every one that cylinders cannot work unless adequately cooled off either by means of water circulation, by air, or by a fluid or liquid of some description or other. It is necessary also to keep the heat of the walls sufficiently low so that the oil will not lose its body. It would appear, therefore, that the more the walls are cooled the greater will be the loss of the calories, for more of them will be carried off in the cooling fluid. The greater the number of calories that are removed, the less the work that will have to be performed in converting them into power, which seems to be logical. It remains, therefore, to cool the walls just sufficiently to prevent the oil from losing its body, which temperature in the case of good oil is about 250 degrees Centigrade.

With water cooling it is necessary to maintain the temperature of the exterior walls at 100 degrees Centigrade, but with air there is no limit. Unfortunately it is not possible to regulate the amount of cooling by air, and the necessity for certain parts of the motor, such as slide or exhaust valves, being kept at a relatively low temperature compels one to keep the walls of the cylinder cooler than would otherwise be necessary.

It is proposed here to show how the inconveniences of water and air cooling can be overcome. Certain solutions were found which possessed a fusion point of about 150 to 200 degrees Centigrade and with the same qualities as water inasmuch as they can be directed in circulation to the points desired, at the same time maintaining a fixed temperature which proves to be the most advantageous. M. Boursin made some experiments at the Conservatoire des Arts et Métiers, the solution that gave the best results being one that had a temperature of fusion of 170 degrees Centigrade. M. Faroux gave the results obtained by M. Boursin in *La Vie Automobile* with this solution. They are given here, together with the reasoning that M. Boursin puts forward to justify the results.

The inventor made three experiments, the first with his solution as a cooling medium; second by water cooling; and the third with the Boursin solution, but after changing the lift of the exhaust valve. The results of these three experiments are as follows:

1. Cooling by Boursin Solution

Test commenced after allowing the motor to run for one hour.
Mean number of revolutions per minute............... 1,130
Corresponding power .... 4.22 horsepower
Amount of gasoline consumption for two hours run..3 kilos. .054

The metal radiator was maintained at a constant temperature of 40 degrees Centigrade.

2. Cooling by Water

Test carried out under the same conditions, commencing after the water reached a temperature of 93 degrees Centigrade. The chef du laboratoire gave the ignition advance an increase of two notches for this test.
Mean number of revolutions per minute................ 1,160
Corresponding power .... 4.25 horsepower
Amount of gasoline consumption for two hours run..3 kilos .557

The same power was obtained, but with a 16 per cent. increase in consumption.

3. Cooling with the Solution

The third test was made with the solution, after having increased the lift of the exhaust valve by three millimeters, when the consumption decreased to 2 kilos .700.

At the same time the power increased considerably. From these tests M. Boursin draws the following conclusions:

The temperature of the exhaust is increased; therefore less calories are absorbed by the walls, giving more power.

The evenness of the power output is characteristic.

In order to take advantage of all the points that are contained in using the Boursin method one must act as follows:

(a) If economy is sought after, it is necessary to decrease the induction by about one-third, retaining the same compression.

(b) In order to increase the power to an equal consumption increase the sizes of the valves.

M. Boursin theoretically justifies the results obtained by the following method:

It is admitted that the heat transfer can only be effected by radiation or by conversion.

1. By Radiation

Let Q equal the amount of heat transmitted per square meter surface per hour expressed in calories.

$T =$ the temperature of the exterior surface.

$$T = 273 + t$$

$T' =$ the temperature of the interior.

$$T' = 273 + t'$$

*Calorie is the metric unit of heat. It is the amount of heat required to raise one kilogram of water one degree Centigrade at or near 4 degrees C. One British thermal unit equals 0.252 calories. One calorie equals 3.968 British thermal units. One calorie equals 426.8 kilogram meters, which equals 3087.1 foot pounds.

$$Q = 4.6\left[\left(\frac{T}{100}\right)^4 - \left(\frac{T'}{100}\right)^4\right]$$

As

$T = 473$ $\quad T' = 323$

therefore $Q = 1{,}830$ calories.

The total surface being 20 dm^2, the result would be

Heat lost by radiation: $1{,}830 \times 0.2 = 366$ calories.

2. By Conversion

Supposing that

T = the elevation of temperature,
S = surface ventilated in square centimeters ,
V = speed of the air,
Q = the heat given off in watts.

$$T = \frac{550\ Q}{S\ (1 + 0{,}1\ v)}$$

Expressed in joules (one calorie equals 4.160 joules).

$$T = \frac{550 \times 4.160\ Q}{S\ (1 + 0{,}1\ v)}$$

If it is a case of calories per hour instead of per second and if S is reckoned in square meters

$$T = 0.0637\ \frac{Q}{(S\ 1 + 0{,}1\ v)}$$

and Q equals 1,067 calories, which makes a total lost in one hour

$$1{,}067 + 366 = 1{,}433 \text{ calories.}$$

As the motor consumed during this time 1 liter .350 of gasoline; then $1.35 \times 12{,}000 = 16{,}200$ calories have been expelled.

Admitting the general idea that 50 per cent. is lost in the walls, 8,100 calories should have been accounted for. But only 1,433 have been accounted for! Without wishing for a moment to re-echo M. Boursin, it is a fact that motors cooled by air have a greater power output in general than those cooled by water, which can be attributed to the cooling of the latter being less intense than in the former.

Therefore, from a first glance it would seem that an increase of power output of a motor can be expected from suppressing cooling by water and substituting a more appropriate method, or by utilizing lubricants capable of withstanding high temperatures. In other words, "the heat that passes through the cylinder walls is heat that can be turned into power, and any increase in this direction will increase the power" (Letombe).

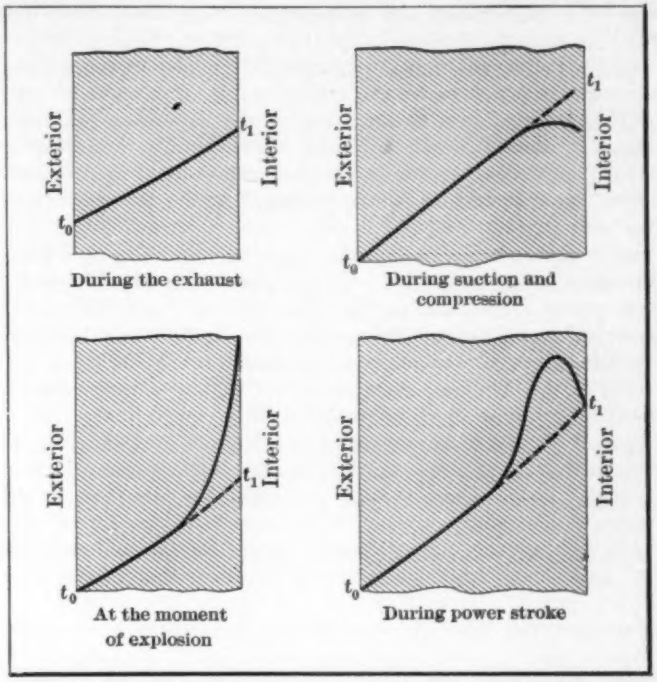
But other experiments seem to contradict those above related. For example, M. Hubert in his report on the test of the 1,200-horsepower Cockerill motor carried out in November, 1901, and published in the *Revue Universelle des Mines* (third part 1902), states that the thermal output of the machine was not affected by the circulation in the cylinder jackets being more or less active irrespective of the temperature at the point of leaving. It is well worth remembering that the temperature of the circulating water can be altered from 30 or 40 degrees to 100 degrees Centigrade by varying the speed of the circulation, which gives a step from 60 to 70 degrees similar to that obtained by M. Boursin in his experiments.

M. Letombe also made several experiments along the same lines, and arrived at the following conclusion, which is particularly interesting:

"For a given motor the forms of the diagrams do not vary; the sum of the heat dissipated by the walls and the exhaust is very nearly constant."

Based on the results of his experiments M. Latombe built a theory for internal combustion motors which is very interesting and of which a portion applicable to the point involved is here briefly given.

He states that to utilize the observations on the losses of calories through the walls and their relation to the indicated output it is necessary to take certain indispensable precautions, because phenomena are so complex in motors that it is very easy, through inadvertence, to attribute losses to the wall that do not exist. At the outset only indicated power must be taken into consideration, and the motor should be tested to make sure that piston and valves work freely, because the mechanical output of a motor can vary with the temperature of the cylinder jacket.



Showing by means of diagrams the propagation of heat through the walls of the cylinder during the four cycles of an internal combustion motor.

For example, if a piston is a very exact fit and the cylinder jacket is maintained cold, the latter could not expand perceptibly.

On the other hand, the piston, if it is not cooled, will expand and have a tendency to bind in the cylinder and the mechanical loss will be high. But if the water in the jackets is allowed to attain a good heat the piston will take up the play necessary to its good operation and the motor will give a larger output for an equal amount of fuel.

Remarks of this character in connection with tests nearly always attribute the augmentation of power to the diminution of loss through the walls. The observation of indicated work puts such an error in the shade. On the other hand if the pistons are not a good fit or the oil used for lubrication of the cylinders is not capable of resisting high temperatures, an increase of effective power can be obtained by lowering the temperature of the water in the jackets. This proves that in changing the form of water circulation around the cylinders it is possible that certain slight modifications can be made that will greatly influence the results.

Difficulties that are encountered in carrying out tests on internal combustion motors are often conducive to erroneous conclusions. Furthermore, certain experiments have caused those carrying them out to fall into the mistake of believing that heat was lost through the metallic walls at a high rate of speed. M. Letombe relates the following experience: "Taking two motors, one with the crankshaft at rest and the cylinder filled with a normal combustible mixture, the other allowed to run and the circulating water made to pass after heating from the latter through the jackets of the stationary motor, it was possible to maintain the walls of the two cylinders at the same temperature. A pre-determined mixture was introduced into the cylinder of the first motor artificially and exploded and the pressure developed was observed. This pressure gave a loss of heat nearly as great as when the cylinder was in a cold state." The conclusion drawn from this was that the working cylinder would lose as much and that the circulating water in the jackets car-

ried off a large quantity of heat that could be transformed into power.

But as the author rightly remarks, the cylinder of the stationary motor was not under the same conditions, in point of view of absorption of heat of the walls, as the motor that was running. In order that this could be so it would be necessary to admit that at all times the two faces of the walls of the cylinders cooled by a current of water remained at the temperature of that water.

Quite the contrary is the case, however, and there is a great difference in the temperature of these two faces of the cylinder while the motor is running. The one in contact with the cooling water is maintained at the temperature of the water, whereas the other face conforms to the temperature of the gases enclosed in the cylinder. As a matter of fact it takes the heat a much longer time to traverse the walls of the cylinder than it takes for a cycle to be accomplished. Time, therefore, plays an important part in the question of the transmission of heat through a body. The following test, which has often been made, confirms this point of view: From a motor that is cold take the first curve of the indicator diagram corresponding to the first explosion. Although it is cold it shows that the pressure of the gas rises relatively little and the exponent $\gamma = \frac{C}{c}$ of the power stroke curve attains the very elevated values of 1.5 to 1.6. Much heat is lost in the cold walls, but as soon as the cylinder is warmed up the pressure increases normally and the γ of the power curves ranges between 1.3 and 1.35. The heat is therefore accumulated in the walls until it reaches a point of equilibrium limiting quickly the absorption of heat during the explosion and power strokes.

Another experiment is as follows: Having a motor on a test running at full speed, the water circulation was increased in the jackets so that the temperature of the ingoing and outgoing flow varied a few degrees. Having obtained this result, the throttle and the cock on the water inlet are closed simultaneously and the motor is allowed to stop. The readings on a thermometer, after it has been placed in the jacket of the cylinder, can be observed to gradually rise and sometimes after a few minutes reach boiling point. The slowness of the transmission of heat through the wall is thus demonstrated. But if the heat passes through the walls slowly the two faces of this wall—or, to borrow M. Letombe's well-turned expression, the "pellicules"—both interior and exterior, are, so to speak, balanced by the fluids that bathe them.

M. Letombe recalls the experiments of M. Marcel Deprez. "When a gas traverses from one end to the other a pipe kept at a mean temperature, provided that the pipe is long enough to allow all of the gas molecules in their passage to come in contact with the metal wall, a thermometer placed at the exit where the gases escape will show that the gas, no matter what the speed of travel (in the case of the experiment it was one meter to one hundred meters), always heats practically to the same number of degrees."

As the wall of the tube used, although very thin, could not be considered a negligible quantity because air was passed through it, varied from one to one hundred meters per second, observations showed a decrease of several degrees of tmperature which occurred between the two walls of the tube by reason of the slowness of heat transmission through conductibility. This experience shows that the change of heat from molecule to molecule should be considered to take place instantaneously.

M. Letombe took up the experiments of M. Deprez, completing them along the lines that he was following. Instead of taking a thin tube he took a thick one. After having made certain that the temperature of the tube was uniform by means of a bath of boiling water, that surrounded it, he passed cold air through it at high speed. At the start of the experiment it was found that the temperature of the air practically took the same temperature as the bath, but nearly immediately afterwards the temperature gradually decreased. This experiment shows two things:

1. That air in motion heats instantaneously when it comes in contact with a hot wall.

2. That the transmission of heat through the walls is far from being instantaneous, and on the contrary is slow, because a speed of air current is found for which the transmission cannot be fast enough to prevent a decrease in the temperature.

M. Letombe made another and still more convincing experiment. A thick tube was installed but not heated, so that it was possible to alternately circulate through it for a few seconds currents of hot and cold air. A thermometer placed at the exit of the tube showed an increase of the temperature of the cold air, bringing it up practically up to the temperature of the hot air. This phenomenon was more noticeable the faster the injections of the cold and hot air were made.

The following are the postulates from which the author of this theory takes his different experiments and on which he bases his theory:

1. In a gas all the parts of which are in equal movement (motion) the molecules possess a relative motion to each other, which causes them to strike each other with such rapidity that there cannot exist practically any perceptible difference of temperature at any point of the mass.

2. When a gaseous mass strikes a wall of metal the internal "pellicule" of such wall is put, in an inconceivably short space of time, in the same state of heat as the mass and follows it in all its heat variations.

3. If on the contrary the transition of the heat is slow to pass through metal walls it shows that the molecules of the metal do not possess the extreme mobility possessed by the molecules of the gases.

If the preceding remarks are applied to the cylinder of an internal combustion motor it means in so many words that during the time the motor is running the pellicule of the wall of the cylinder that comes in contact with the cooling water is always maintained at the temperature of the water, and that the interior pellicule on its side is constantly maintained at the temperature of the gases that strike. The transmission of the heat through the walls cannot be carried out from one face to the other effectively inasmuch as the gases that strike this wall do not suffer from their own expansion a decline in temperature more rapid than the speed which the propagation of heat occupies to traverse these walls, in which case an inverse phenomenon is produced and the gases take from the walls the heat that they had imparted to them a moment before.

Therefore during the moment of exhaust a certain amount of heat penetrates the walls; during the suction stroke this heat is taken back by the incoming gas; during the compression this operation still goes on. At the moment of explosion there is an increase in heat. The interior pellicule immediately becomes equal in temperature to the gas; the heat penetrates the wall. But as the expansion immediately follows the explosion the quantity of heat given off the wall rapidly diminishes and the calories have not the time to escape. They return in the cycle and are absorbed.

M. Letombe concludes with the following statement: "In reality the heat only traverses the walls of the cylinders by pulsations, the active part of which takes place during the exhaust period. In other words, in internal combustion motors the sum of the heat lost through the walls and through the exhaust is practically a constant which only depends upon the cycle adopted."

The three following examples confirm this manner of viewing the situation:

1. Whenever it is found possible to diminish the loss of heat through the walls in a motor through the water circulation it will be found that the heat losses augment through the exhaust and inversely.

2. In big motors particular attention must be paid to the cooling of the exhaust valves. In these machines, as a matter

of fact, the cooling of the walls is more difficult; on account of their weak surface and their thickness the gases escape at a higher temperature.

It is known, however, that the interior surface of a one-cylinder motor does not increase in proportion to its volume.

Taking D as the diameter of a cylinder and L the length the interior surface can be expressed by the following, including ends:

$$S = 2\frac{D^2}{4} + \pi D L$$

and the volume

$$V = \frac{\pi D^2 L}{4}$$

By the following equation

$$\frac{S}{V} = 2\left\{\frac{1}{L} + \frac{2}{D}\right\}$$

which value diminishes as L and D increase.

Based on this form of reasoning, one concludes that because the influence of the detrimental surfaces decreases with the volume large motors should have a very much better efficiency than small motors. M. Letombe gives the example of two motors, one with a 300 millimeter bore and 100 millimeter stroke giving 20 horsepower and the other with a bore of 600 millimeters and a stroke of 800 millimeters giving 100 horsepower. The relation in the first case of $\frac{S}{V}$ is 1.84, and in the second motor 0.91.

If the first motor were to lose 40 per cent. of heat through the walls then the second would only lose 20 per cent. The output of the second ought to be 20 per cent. greater than the first. In practice this is not the case. The difference, should any exist, is much less and perhaps is due to the mechanical efficiency or other purely constructional causes.

3. A last remark which seems to prove that the advantage on the walls does not seem to add anything to the cycle is the following:

In two-cycle motors with air-cooling the loss through the walls is not much above 18 per cent. instead of from 30 to 35 per cent., as is the case with four-cycle motors. Provided that the compression of both is equal, no superiority can be claimed for the first over the second, and as a matter of fact the inverse is the case.

Here one is confronted by two different conclusions. On the one side the experiments of M. Boursin show that greater efficiency can be obtained from air-cooled motors, from motors with hemispherical sleeves and from the Gobron Brille motor. On the other hand the experiments made by M. Letombe and the examples he gives to prove the truth of his theory; the example of the large motor and the two-cycle type, etc.

How is it possible to harmonize these apparently opposed results? What is the truth? What is actually the influence of the walls? Is it advisable to urge inventors on in their efforts along the lines that by decreasing the loss of heat through the walls they will obtain better efficiency, or is it time to cry "Wrong route!"

The author does not pretend to solve the problem, the importance of which is apparent to all. He simply places it in all its phases and analyzes it as much as possible in order to draw out the points that are clear and to state those that are not clear.

The points that are clear are:

1. The heat takes much longer to traverse the walls of the cylinder than it takes for a cycle to accomplish its work.

2. The surface of a metal wall follows instantaneously the temperature of the liquid that washes it and follows the variations of temperature of the liquid.

These two points do not confirm or refute the two theories presented. Admitted that the heat traverses the cylinder walls only slowly, and in any case more time than it takes for two revolutions of the motor, and admitted that the internal pellicule is always at the same temperature as the gas in the cylinder, it does not necessarily follow that the heat does not escape only during the exhaust stroke.

However, this seems probable. At the firing moment the heat accumulates in the walls. If the firing ceases before the opening of the exhaust valve, a certain amount of this heat is given back to the gas; if the deflagration does not terminate in the cylinder (a case where the mixture keeps alight a long time), the amount of heat accumulated is very high and the temperature in the cylinder remains practically constant. There is only reconveyance during the exhaust stroke. As a matter of fact it is known that motors of this sort have a very hot exhaust and heat up.

Inaccessible Piping to Be Avoided—Piping is sometimes so installed as not to be accessible; this is really much to be avoided, since it is just such installations that are likely to give trouble, as piping so placed will have a hole chafed in it, and in cramped quarters no one can be sure the piping does not rub against edges of laterals, on the chassis.

Calendar of Coming Events

Catalogue of Future Happenings in the Automobile World That Will Help the Reader Keep His Dates Straight—Shows, Race Meets, Runs, Hill Climbs and Other Events.

Shows and Exhibitions.

April 12-15	Sioux Falls, S. D., Annual Show.
April 26-29	Utica, N. Y., Annual Show, State Armory.

Race Meets, Runs, Hill-Climbs, Etc.

April 20-22	Lancaster, Pa., Three-Day Endurance Run, Lancaster County Auto Trade Association.
April 22	New York City, Commercial Vehicle Parade, Motor Truck Club.
April 22	Redlands, Cal., Annual Hill Climb.
April 29	Guttenberg, N. J., Track Races.
Date indefinite	Oakland, Cal., Track Races, Oakland Motordrome.
Date indefinite	Shreveport, La., Track Races.
April 29	Philadelphia-Atlantic City Roadability Run. Quaker City Motor Club.
May 16-19	Washington, D. C., Four-Leaf Clover Endurance Run. Automobile Club of Washington.
May 25	Chicago, Ill., Fuel Economy Test, Chicago Motor Club
May 27-31	Chicago, Ill., Five-Day Tour to Indianapolis, Chicago Automobile Club.
May 29-31	Chicago, Ill., Tour to Indianapolis, Chicago Motor Club.
May 30	Indianapolis, Ind., Five-Hundred-Mile International Sweepstakes Race, Motor Speedway.
June 15, 16, 17	Dayton, O., Midsummer Meeting Society of Automobile Engineers.
June 19-25	Glidden Tour, Washington, D. C., to Ottawa, Canada.
June 22	Algonquin Hill Climb, Chicago Motor Club.
Aug. 25-26	Elgin, Ill., National Stock Chassis Road Race, Chicago Motor Club.
Oct. 9-13	Chicago, Ill., Thousand-Mile Reliability Run, Chicago Motor Club.

Foreign Fixtures.

April 16-23	Prague, Austria, Annual Show.
April 23-28	Modena, Italy, Touring Car Contests.
May 1-15	Turin, Italy, Automobile Salon.
May 7	Sicily, Targa Florio Road Race.
May 14	Barcelona, Spain, Catalona Cup Road Race.
May 21	Ries, Austria, Hill-Climb.
May 25	Meuse Hill-Climb, Belgium.
May 25	Le Mans, France, Touring Car Kilometer Speed Trials.
May 28	Le Mans, France, Hill-Climb for Touring Cars.
May 28	Start of Touring Car Reliability Trials in Germany.
June 1	Bucharest, Roumania, Speed Trials.
June 4	Trieste, Austria, Hill-Climb.
June 18	Boulogne, France, Voiturette and Light-Car Road Races.
June 25	Sarthe Circuit, France, Grand Prix of Automobile Club of France.
June 25-July 2	International Reliability Tour, Danish Automobile Club.
July 5 to 20	Start of the Prince Henry Tour from Hamburg, Germany.
July 9	Susa-Mont Cenis Hill-Climb, Italy.
July 13-20	Ostend, Belgium, Speed Trials.
July 21-24	Boulogne-sur-Mer, Race Meet.
Aug. 6	Mont Ventoux, France, Annual Hill-Climb.
Sept. 2-11	Roubaix, France, Agricultural Motor Vehicle Show.
Sept. 9	Bologna, Italy, Grand Prix of Italy.
Sept. 10-20	Hungarian Voiturette and Small-Car Trials.
Sept. 16	Russian Touring Car Competition, St. Petersburg to Sebastopol.
Sept. 17	Semmering, Austria, Hill-Climb.
Sept. 17	Start of the Annual Trials Under Auspices of *l'Auto*, France.
Oct. 1	Gaillon, France, Hill-Climb.

THE AUTOMOBILE

Vol. XXIV Thursday, April 13, 1911 No. 15

THE CLASS JOURNAL COMPANY
H. M. SWETLAND, President
A. B. SWETLAND, General Manager
231-241 West 39th Street, New York City

EDITORIAL DEPARTMENT
THOS. J. FAY, Managing Editor
GEORGE M. SCHELL, Associate Editor
JAMES R. DOOLITTLE HUGH P. MacCONNELL
HANS WEYSZ

ADVERTISING DEPARTMENT
W. I. RALPH, 1035 Old South Bldg., Boston
C. H. GURNETT, L. G. VOGEL, 1200 Michigan Ave., Chicago
T. B. VAN ALSTYNE, New York and Phila.
H. L. SPOHN, New York
LOUIS R. SMITH, New York
FRANK B. BARNETT, 309 Park Building, Cleveland
H. H. GILL, 627 Ford Building, Detroit

Cable Address - - - - - - - - - - - - - - - - - Autoland, New York
Long Distance Telephone - - - - - - - - - - - - 2046 Bryant, New York

SUBSCRIPTION RATES
United States and Mexico - - - - - - - - - - - - - One Year, $3.00
Other Countries in Postal Union, including Canada - - - - One Year, 5.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

FOREIGN SUBSCRIPTION AGENTS
ENGLAND:—W. H. Smith & Sons, Ltd., 186 Strand, London, W. C., and all bookstalls and agencies in Great Britain; also in Paris at 248 Rue de Rivoli.
FRANCE:—L. Baudry de Saunier, offices of "Omnia," 20 Rue Duret, Avenue de la Grande Armee, Paris.
GERMANY:—A. Seydel, Mohrenstrasse 9, Berlin.

Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

MISDIRECTED energy is the greatest economic waste in our form of civilization. There is no better illustration of this fact than is shown in the following extract from publicity that was sent out by the American Automobile Association on April 7, in the light of the information that is imparted in the leading article of THE AUTOMOBILE of this issue. The A. A. A. stuff reads:

"Federal aid in road building was the most important subject discussed at the April meeting of the Executive Committee of the American Automobile Association, held at the national headquarters, 437 Fifth avenue, New York. Throughout the entire country highway improvement is commanding greater attention than ever before, and the motorists have learned that much of the work connected with the betterment of road-traveling conditions comes to them because of their intra-state and interstate touring."

In the meantime the roads under the noses of the officials of the A. A. A. are so down at the heels that the automobilists who are supposed to be benefited by national organizations are so served that $20,000,000 would scarcely pay for the tires that are being ground to powder in a single year. It is not to be inferred that the A. A. A. is in duty bound to advocate good roads, or, better yet, pavement, for New York City, but if its influence is so great that it can interfere without getting its tail pinched, as it were, with the workings of the Office of Public Roads, in Washington, what a boon it would be were some of this influence brought to bear upon the Mayor of New York for the good of the automobile industry!

* * *

PUTTING money into pavement, or other forms of street improvement, is like casting it into the sea if the pavement is not kept in a state of good repair, and that New York City has a sea of this character that will soon swell into the proportions of an ocean is one of the points that we may be sure of unless some way can be contrived to get rid of the officials who are responsible for the present state of affairs. Such a condition of things cannot be imagined as ever having existed before, and to merely call attention to the facts in the matter, hoping that the officials will get busy, is an idea that should be abhorred by every man who has any business training at all. No man of normal mind would think of retaining in his service the class of talent that allows the pavement to depreciate to a point where, if there is any of it in good condition, it takes a whole day to find it. It is scarcely necessary to point out the present deplorable state of the pavement on Manhattan Island—every automobilist knows all about it. The only question is, what shall be done? Are we to be pestered by insane automobile legislation year after year and stand for "chuck holes" in lieu of pavement besides? Will history relate how upwards of 40,000 automobile owners in New York City, representing $150,000,000 in automobile investments, were too docile to say "boo"?

* * *

IF there is no organized body of automobilists who will undertake to tell the Mayor of New York what should be done about the repairing of the streets, would it not be a good idea for the automobilists to rally around themselves and put the question? Broadly speaking, is it not true that this is a condition that amounts to a disease in America? We are assessed for streets and roads; the money goes; the streets are "improved"; the officials in charge then point with pride to the good that must be traced to their industry, and the decaying process starts at this point. What possible sense is there in investing money, heaps of it, in pavement, if the investment is not to be conserved? Certainly there is a remedy; it does not lie in accepting the promise of that type of official who is afraid of offending some one if he makes a protest. The protest must be made; it must be followed up by another one, and the third protest must bound along on the heels of the second—action is the thing. Get busy!

* * *

REORGANIZING the A. L. A. M. into the "Automobile Board of Trade" is an accomplished fact. The life of the A. L. A. M. was a long period of virile action on the part of the capable officials who had the welfare of the automobile industry at heart. The new plan is one of wisdom bounded by ample opportunity for distinguished service, and it is nothing less than this type of service that is to be expected from the body that is destined to serve as a sheet-anchor for the industry that has leaped from its position of precarious obscurity to third place in the list of American industries within a little more than a decade. What the A. B. of T. proposes to do is indicated by the name that it has taken.

A. L. A. M. Passed Out of Existence

A. B. of T. Has Taken Up the Work

Following the meeting of the Board of Managers of the Association of Licensed Automobile Manufacturers at the New York headquarters, April 5, the manufacturers perfected plans for the formation of an organization to be known as the Automobile Board of Trade to succeed the A. L. A. M.

AT the A. L. A. M. meeting with President Clifton in the chair, Colonel George Pope, on behalf of the Show Committee, reported the result of the recent show at Madison Square Garden, which exceeded in attendance, in the number of exhibits, and in profits, any previous exhibition of the kind. A dividend of 50 per cent. was declared and a vote of thanks extended to the Show Committee. In accordance with the usual custom the dates for next year's show will be the second and third weeks in January, the show opening on January 6.

Among those at the meeting were: D. S. Ludlum, Autocar Co.; J. W. Lambert, Buckeye Mfg. Co.; James Whittemore, Buick Motor Co.; Hugh Chalmers, Chalmers Motor Co.; H. W. Nuckols, Columbia Motor Car Co.; M. S. Hart, Corbin Motor Vehicle Corp.; B. A. Becker, Elmore Mfg. Co.; F. P. Delafield, Everitt-Metzger-Flanders Co.; G. H. Stilwell, H. H. Franklin Mfg. Co.; Elwood Haynes & A. E. Starbuck, Haynes Automobile Co.; E. H. Broadwell, Hudson Motor Car Co.; A. N. Mayo, Knox Automobile Co.; S. T. Davis, Jr., Locomobile Co. of America.; H. A. Lozier, Lozier Motor Co.; F. F. Matheson, Matheson Motor Co.; Wm. T. White, Mercer Automobile Co.; Wm. E. Metzger, Metzger Motor Car Co.; James W. Gilson, Mitchell-Lewis Motor Co.; Wm. H. VanDervoort, Moline Automobile Co.; E. J. Moon, Moon Motor Car Co.; C. C. Hanch, Nordyke & Marmon Co.; Geo. C. Daniels, Oakland Motor Car Co.; M. J. Budlong & S. D. Waldon, Packard Motor Car Co.; L. H. Kittredge, Peerless Motor Car Co.; Chas. Clifton & Wm. B. Hoyt, Pierce-Arrow Motor Car Co.; George Pope & A. L. Pope, Pope Mfg. Co.; R. E. Olds, Reo Motor Car Co.; Geo. J. Dunham, Royal Tourist Car Co.; R. H. Salmons & G. C. Gordon, Selden Motor Vehicle Co.; F. B. Stearns, F. B. Stearns Co.; I. H. Page & Harry Fosdick, Stevens-Duryea Co.; C. F. Redden, Studebaker Automobile Co.; E. P. Chalfant & F. R. Humpage, E. R. Thomas Motor Co.; Windsor T. White, Waltham Mfg. Co.; John N. Willys and G. W. Bennett, Willys-Overland Co.; Thos. Henderson, Winton Motor Carriage Co.; Alfred Reeves, General Manager A. L. A. M.

Industry Supports Critical Inspection

WHATEVER conservative ideas may have been indulged in by the captains of the automobile industry seem to be expanding under the sunshine of April days, and the advent of the selling season. A brief visit to a few leading manufacturers reflects a substantial confidence in the industry for the present year. In most cases a somewhat curtailed output is regretted and reports from the great sales centers indicate an increasing rather than a diminishing demand for standard production. Most reassuring is the quality offered the consumer. Numerous refinements coupled with closer inspection and most exact finish are rapidly placing the buyer in a position to receive full value in standard purchases whatever may be his selection and leaving open to him the option of pleasing design somewhat independent of mechanical detail. The high quality of the year's product will substantially increase the demand and the legitimate development having been discounted will assist in putting the business of the year on a sound financial basis.

Glidden Trophy Suit Goes Over Sixty Days

Another long delay must intervene before the final decision in the Premier-Chalmers litigation over the Glidden Trophy of 1910 is settled. Supreme Justice Josiah T. Marean before whom the hearing was had in Brooklyn has adjourned the case until June 7. In the meantime a commission will take testimony in various parts of the country as to the bona-fides of the claim that the Premier 6-60 cars were equipped with the oil-pump and tank which was brought into question after the Glidden tour.

The court held at the opening of the hearing that the burden of proof was upon Chalmers and A. A. A. to show that 57 of the Premier 6-60's were not equipped with the oiler and Harold O. Smith, president of the Premier Co. had testified that the factory records at hand were incomplete to show that his company had sent out that number of cars.

Judge Marean's rulings were to the effect that when the A. A. A. accepted the entry of the Premier; passed upon the stock status of the car prior to the event, and allowed it to compete that the A. A. A. was not entitled to foreclose the right of the Premier to the trophy unless fraud was shown.

S. A. E. Committee on Solid Tires

Recommendations covering the sizes of wheels for solid tires have been made by the Division on Wheel Dimensions and Fastenings for Solid Tires, of the Society of Automobile Engineers.

The following prominent members of the tire industry were present at the session: W. H. Allen, P. E. Bertsch, A. A. Brewster, I. J. Firestone, James L. Gibney, E. R. Hall, P. W. Litchfield, F. F. Phillips, E. S. Roberts, O. D. Smith, B. C. Swinehart, J. W. Thomas, O. J. Woodward, W. W. Wucheter.

The committee recommended that all wood wheels for solid tires shall be fitted with a permanent iron band.

A. L. A. M. Assessed for Selden Suit

A final decree was entered on April 6 in the United States Circuit Court in the Selden automobile patent case. As THE AUTOMOBILE related at the time, the Selden contention was reversed in the Circuit Court of Appeals, with costs to the plaintiffs. In the final decree, which followed the decision of the Circuit Court of Appeals, the plaintiff has been assessed for costs in the amount of $31,880.42.

A. C. A. Elects Full Set of Officers

Officers of the Automobile Club of America were elected Tuesday night as follows: Henry Sanderson, president; George W. Perkins, vice-president; Robert L. Morrell, second vice-president; Edward Shearson, third vice-president; Dudley Olcutt, 2d, treasurer; Governors: Henry Evans, Henry R. Taylor, F. D. Underwood and George F. Baker, Jr.

Brooklands' Opening Meet

Typical English weather prevented a large attendance at the initial meeting of the year on the famous track, but eight races were successfully run off. The 27.3 Benz finished first in three of the six events for automobiles, the scheduled aeroplane contests having been abandoned by reason of the high winds.

BROOKLANDS track at Weybridge, Surrey, is about 20 miles from London by road or rail, and owing to the Arctic weather conditions that prevailed the first meet of the season was not so well attended as might have been expected. The paddock, however, as seen in Fig. 2, was comfortably filled, leaving the more popular-priced parts comparatively empty. Despite a biting cold wind and an occasional flurry of snow some fast times were made. From previous performances of the cars either in races or practice runs a set of handicaps are worked out and most of the races are run on a handicap basis.

Several notable absentees were the Vauxhall Star and Sunbeam, which last year furnished a good deal of the sport. The 15.9-horsepower Singer, however, showed a good turn of speed, winning the third 76 miles per hour handicap from scratch at an average speed of 76.5 miles per hour. Two Mércèdes, both owned by Mr. Gordon Watney, came in second and third. There were ten entrants in this race, which was for cars whose observed speeds or probable speeds came within the limits of from 50 to 76 miles per hour.

The next event scheduled was a match between the Sunbeam and the above-mentioned Singer, but the Sunbeam failed to put in an appearance. Its place was filled by a Benz, rated at 27.3 horsepower, which proved the winner over the five miles at an average speed of 81.25 miles per hour. The Singer came in about 40 yards behind and was perceptibly gaining.

The next race was another handicap for cars that could attain a speed of from 40 to 60 miles per hour. The limit car led for a long time, but was later overhauled by a newcomer, a Multi-Two, which had a start of 2 minutes 28 seconds in a race of 5 3-4 miles. The winner's speed was 43 1-2 miles per hour.

The next item on the program was to be for the Aggregate Time Flight Competition for aeroplanes for which there were twelve entries, but the tantrums of Boreas kept the aeroplanes in their sheds.

Fig. 1—One of the contestants, a Multi-Two, approaching the finishing line. Note the attitude of the driver, whose hands alone are visible.

The fifth number on the program was the March Private Competitors' Handicap, in which three cars faced the starter. But two finished, however, first place going to the Benz, which had 30 seconds start over the Mércèdes over a course of 5 3-4 miles. The winner's time averaged 76 miles per hour.

Six cars took part in the 100 miles per hour handicap, which resulted in a ding-dong fight between the 15.9 Singer and the 27.3 Benz, the latter winning by the narrow margin of 1 second. The winner's speed was 86 miles per hour. The meet wound up with a two-mile sprint, with the contestants in the preceding race pitted against each other. The Singer put up a game fight, but was handicapped by a leaking radiator.

Two motorcycling events were sandwiched between the different car races, the winner's speed rate in one event being 55 1-2 miles per hour. The summary:

THE THIRD 76 M.P.H. HANDICAP

Finish.	Car.	Driver.	Start. M.S.
1.	15.9 h.p. Singer	G. O. Herbert	Scratch
2.	35.7 h.p. Mercédès	E. Tenant	0:54
3.	48.6 h.p. Mercédès	F. Sampson	0:27

MATCH RACE

Finish.	Car.	Driver.	Start. M.S.
1.	27.3 h.p. Benz	L. G. Hornsted	...
2.	15.9 h.p Singer	G. O. Herbert	...

THE FIRST 60 M.P.H. HANDICAP

Finish.	Car.	Driver.	Start. M.S.
1.	14.5 h.p. Multitwo	R. W. A. Brewer	2:28
2.	6.2 h.p. Jackson	S. Hunt	3:10
3.	6.2 h.p. Sizaire	A. Bray	0:52

THE MARCH PRIVATE COMPETITORS' HANDICAP

Finish.	Car.	Driver.	Start. M.S.
1.	27.3 h.p. Benz	A. T. Craig	0:30
2.	59.6 h.p. Mercédès	D. Spies	Scratch

THF THIRD 100 M.P.H. HANDICAP

Finish.	Car.	Driver.	Start. M.S.
1.	27.3 h.p. Benz	L. G. Hornsted	0:33
2.	15.9 h.p. Singer	G. O. Herbert	1:03
3.	27.3 h.p. Benz	G. Wilkinson	0:45

THE MARCH SPRINT RACE

Finish.	Car.	Driver.	Start. M.S.
1.	27.3 h.p. Benz	L. G. Hornsted	0:07
2.	15.9 h.p. Singer	G. O. Herbert	0:15
3.	59.6 h.p. Itala	R. Wildegose	Scratch

Club's Treasury Shows Nice Balance

Showing a considerable balance on the right side of each of its funds, the annual report of the treasurer of the Automobile Club

Fig. 2—Nearing the winning post on the home stretch, as seen from the paddock

of America has been submitted to the club. The general balance sheet presented by Dudley Olcutt, 2d, treasurer, shows that the assets of the club on February 28, 1911, were $1,015,981. This sum is divided into the following heads: Property and equipment, $806,796; working assets, $33,715; current assets, $166,974, and sinking fund, $8,493. The liability side of the sheet shows a balance of $43,592 resulting from operations of the club during the year which is carried over in the surplus account. The surplus of the organization is placed at $389,930.

The expenses of the club, including clubrooms, bar, grill, committees, office, fixed charges, depreciation, general expenses and the item of $43,592 referred to above as surplusage, amounted to $210,828 during the fiscal year. Against this are credited dues, interest, garage charges, except rentals for space, machine shop earnings and the club journal.

The new building account shows assets of $1,095,470. The liabilities under this head consist of first and second mortgages amounting to $704,000 and other items.

The report was made up in pamphlet form and was published under date of April 7. A firm of certified accountants audited it.

Fiat First in 24-Hour

Winner covered 1491 miles in the twice-around-the-clock journey, with a 30-horsepower Cadillac only 43 miles behind. The result will rank as a world's competition record, the only better performance having been a time trial.

Los Angeles, Cal., April 10—The 24-hour race which was run Saturday and Sunday on the 1-mile board speedway resulted in a victory for the Fiat driven by F. Verbeck and V. Hirsh which covered 1,491 miles in the journey twice around the clock. Second was a 30-horsepower Cadillac, which was driven by George Adair and T. J. Beaudet which made 1,448 miles in the 24 hours. Ten cars started in the event and seven finished.

This is the first 24-hour event ever run on a speedway in this country and consequently does not rob the Stearns of its dirt track mark of 1,253 miles made last Summer, driven by Patschke and Poole. It will be placed in the record table as a separate mark under the head of speedway records. It will, however, rank as the world's competition record, for the mark of 1,581 miles, 1,310 yards made June 28, 29, 1907, by S. F. Edge, in a six-cylinder Napier on the Brooklands track in England was a time trial.

The race was free from accident and the two leaders made only a few stops to change tires. The Fiat changed six times and the Cadillac four. During the night the Croxton turned around twice on the oily track when the brakes were suddenly applied, which was the closest approach to an accident throughout the race. The Fiat lost 12 minutes because of clutch trouble at the start and changed radiators in the 22d hour. The Cadillac had no mechanical trouble. The E-M-F ran consistently up to

Fig. 3—Flying start in the third race at Brooklands, showing the saucer effect of the banking

the 18th hour when a hole that was punched in the crankcase put it out. The Velie had similar trouble in the 15th hour. The summary of the race at 6-hour intervals is shown in the accompanying table:

Drivers.	Car.	6 Hours.	12 Hours.	18 Hours.	24 Hours.
Frank Verbeck and V. Hirsh	Fiat	367	744	1,125	1,491
George Adair and T. J. Beaudet	Cadillac	365	718	1,085	1,448
L. Edmonds and John Jenkins	Cole	338	664	934	1,219
J. D. McNay and C. J. Carter	Cutting	233	558	864	1,186
S. Miller and G. C. Kelley	Warren-Detroit	290	605	872	1,167
S. Spergel and D. Barry	Croxton	248	533	843	1,153
G. Ball and O. A. Walling	Schacht	293	555	740	1,013
W. J. Lacass and H. Perry	E-M-F	331	608	Out in 18th hour	
Joe Nikrent and G. Benedict	Velie	345	616	Out in 15th hour	
J. Fouch and H. Fouch	Cameron	124	175	Out in 14th hour	

Quakers Prepare for Run

Philadelphia, April 10—At a meeting of the Quaker City Motor Club, the Hotel Strand was selected as the Atlantic City headquarters of the club's run on April 29.

Pathfinder George E. Potts reported that the route adopted is a pleasant departure from the usual path, and that even with the recent heavy rains the roads are in good shape. Mayor Story, of Atlantic City, has been in communication with President Berger, of the Q. C. M. C., regarding details, and at an early date will confer with Mayor Reyburn concerning the secret time. Exclusive of press and guest cars, twenty-six entries have so far been received.

Automobile to Rural Railways

Chicago, April 10—The International Motor Car Transportation Company is the title of a new concern which has been capitalized for $100,000 and which has for its objects the promotion of a motor service between big cities like Chicago and New York. Those interested in the motor truck line are Edward C. Kingsbury, a Chicago capitalist; Charles M. Hayes, president of the Halladay Motor Car Company, Chicago agent for the Halladay car, and Paul Chubbock, president of the Streator Motor Car Company. Offices have been opened at 905 Majestic Building.

The new company has purchased thirty seven-passenger Halladay touring cars and the first of the routes selected is between Chicago and New York. It is proposed to begin the service May 20 and regular trips beween the two cities are announced on a seven-day schedule each way. Six passengers to a car will be carried and each will be allowed 25 pounds of baggage.

After the service has been put into working order, it is said that there will be trips from Chicago to Montreal, Chicago to Boston, Chicago to the White Mountains, to Philadelphia, Atlantic City and the Wisconsin Lake country. The Chicago-New York route will run by way of Valparaiso, La Porte, South Bend and Goshen to Toledo, then through Ohio to Cleveland, from Cleveland to Buffalo, including a stop at Niagara Falls, then along the Erie Canal route across New York State to Albany and then down the Hudson to New York.

Editor Elected Secretary N. Y. A. A.

Syracuse, N. Y., April 10—J. Arthur Ritchie, of this city, editor of *The Empire State Motorist,* was elected secretary of The New York State Automobile Association to succeed Bert Van Tyle, of Rochester. It is believed here that this selection augurs well for the future of the organization and will likely mean a reorganization of the association. There has been for some time dissatisfaction with the management of the body, and several clubs, including those of this city and of Rochester, have threatened to leave its ranks. Mr. Ritchie's magazine is the official organ of the State Association.

At the meeting held at Albany yesterday it was decided to establish a permanent office in Albany, and Mr. Ritchie will probably be in charge of the offices of the association.

Fig. 4—This picture gives a good idea of the cement banking at one of the curves, showing the winner of third 100 miles per hour handicap.

Extending Activities of the T. C. A.

Branching Out on a National Basis

The original idea of the Touring Club of America was to undertake the work of cementing the relations of automobile clubs in all States through individual automobilists, and by concerted action extending information and valuable assistance to those who desire to do touring on an ambitious basis at home and abroad, with a trend such as might result in the automobilist becoming more familiar with the beauty and grandeur of scenic conditions on the American continent.

NATIONAL touring as a pastime, with educational and recreative advantages in the foreground, has never attained the prominence in this country that is common to the haunts of automobilists in foreign lands, not because there is any lack of places to visit in America such as will compare favorably with the scenic conditions of Switzerland and Egypt, but due to a condition that seems to exist in America which has for its foundation the fact that automobile clubs in the various States fail to join hands, and the only national body that has existed in bygone times in this country was devoted to "professional racing" and other enterprises for gain, so that the individual automobilist, after passing out of the control of his own club, found himself as a stranger, and a self-invited guest, more often than not within a hundred miles of his own home.

It is all very well to extend a "Spanish invitation" to visiting members from neighboring clubs, but the invited one rarely ever accepts hospitality on this basis, due to delicacy on his part, and to the fact that he would be giving trouble to his neighbors, and this is not to be thought of by the well-bred automobilist. A couple of years ago the situation became glaring. It was plain to be seen that there was no national body that was at all inclined to undertake the work of conducting tours, and, after all, the average automobilist, while he likes to go to a race occasionally, is not a "fiend," and he soon finds after purchasing a car that he will fail utterly to derive a dividend from its possession if he confines himself to a mere interest in racing, and limits the length of his tours to points of vantage in the vicinity of his own residence.

It is interesting and instructive to heed the poetic ebullitions of writers whose ingenuity runs riot as they extol the advantages of a long tour, and portray the situations that are said to fortify the health and ripen the experience of the lone tourist. Imagine a banker, whose every-day experience is confined to the rise and fall of the market and the credits of merchants, starting out on a long tour unprepared for any emergency excepting for the generalship that may possibly reside in the new chauffeur whom he engages for the occasion. If psychology has a place in the world it must surely teach the doctrine of a continuation of that prudence of which bankers have a full supply. And the situation will scarcely be changed if a grocer is substituted for a banker, or if any man of some means and leisure desires to sojourn in an automobile over the give-and-take of the roads of this country. But the whole problem is being solved by the Touring Club of America, with headquarters in New York City, and branches which are being opened in the various cities from the Atlantic to the Pacific and in foreign lands.

The man who desires to tour on his own account, if he is a member of the Touring Club of America, may obtain at the

Fig. 1—Rear of the main floor approaching the manager's office and foreign department, with a table in the foreground holding current periodicals for the edification of calling members

Fig. 2—At the entrance of the Touring Club of America, looking toward Broadway, showing the Route Guide files and the Insurance Department

headquarters in New York or at the branches as they are established in the various metropolitan centers the character of touring information that he may rely upon as being authentic and appropriate, including the *Automobile Blue Book* and district route maps that will serve his every purpose. There is a relation between the large number of hotels as they are scattered along the accepted routes of touring, and when the automobilist presents his credentials to the "boniface" he is at once assured of the best that the hostelry affords, and the bill that will be presented to him when he terminates his period of guestship will be conspicuous for its reasonableness.

Touring Parties May Be Afforded the Advantage of a Touring Director Who Will Assume Charge of Every Detail of the Undertaking, and Personally Conduct the Party Wherever It May Care to Go

If, perchance, along the highways something about the car goes amiss, to telephone to the nearest "listed" garage is tantamount to receiving prompt relief, and the repairs that may have to be done to the car will be as good as the tourist will be able to obtain from his favorite garage in his home district, and the bill for the work will be eminently fair. There is every reason to believe that the exigencies of touring for the automobilist who prefers to make his migrations unaccompanied by a cavalcade, will be met with the best of attention from hotels, garages and supply stores, for the reason that a complaint from a member of the Touring Club of America of any unfair treatment on the part of

Fig. 3—Waiting place for the inquiring automobilist, with facilities whereby he may take up and investigate touring matters of interest to him

any of these establishments will be promptly investigated, and if the evidence warrants satisfaction will be demanded.

The idea of a tour from the Atlantic to the Pacific, visiting the points of historic interest on the way, stopping over in the places of scenic grandeur long enough to make short excursions to the very apex of Nature's most wondrous hiding places, going the length of short hunting excursions, and even emulating the historic Izaak Walton in fishing jaunts!

The cost of an organized tour under the direction of an efficient management will be reduced to insignificance as compared with what it would be were the same number of automobilists to merely get together and decide to make the trip unattended by skilled management, and all that it implies. It is even possible to foresee the time when a set of business men may club together and obtain, through the Touring Club of America, every facility for a long trek or a week-end jaunt, including the automobiles for the purpose, a suitable repair car, a seasoned guide, with the stopping places, including accommodations, all booked ahead, and at a cost that would be far below the price of a trip of the same duration in any other way.

New Interest Is Being Taken in the Local History of the Districts Through Which Automobilists Sojourn During Vacation Time

The speed-mad automobilist traverses the districts that afford him the fullest opportunity to try out the going qualities of the automobile that he unconsciously destroys by speeding, but he never sees anything but a white streak ahead, nor is his being permeated by anything but the subconscious thought that an occasional barn-yard fowl will feel the brunt of his madness. The intellectual automobilist, being alive to the fact that every spot on the Continent is associated with something of an historic significance, is taking advantage of the facilities available in the Touring Club of America, whereby a route, either long or short, may be mapped out, listing the historic points of advantage after a fashion not unlike the Baedeker plan which did so much to make England as an open book to the English.

The illustrations presented with this article show the headquarters of the Touring Club of America at Broadway and Seventy-sixth street, where unassigned route experts are held in readiness to do the bidding of those who take advantage of the facilities of the club, and, quite apart from the work as hereinbefore outlined, the problems that are solved for the members include the shipment of cars abroad, insurance matters, the arranging for foreign tours either with the owner's car or including the procuring of a car after the owner arrives on the other side, the compiling of definite touring information in regard to a proposed tour, long or short, with specific route cards, and a list of the Baedeker features to accord with the particular ideas of the respective applicants, the taking care of the licensing problem in the several States, arranging for bonds and all the other services that relieve the owner of hampering responsibilities and reduce the touring question to one of unalloyed pleasure, and that fair measure of profit of which the automobile is the foundation.

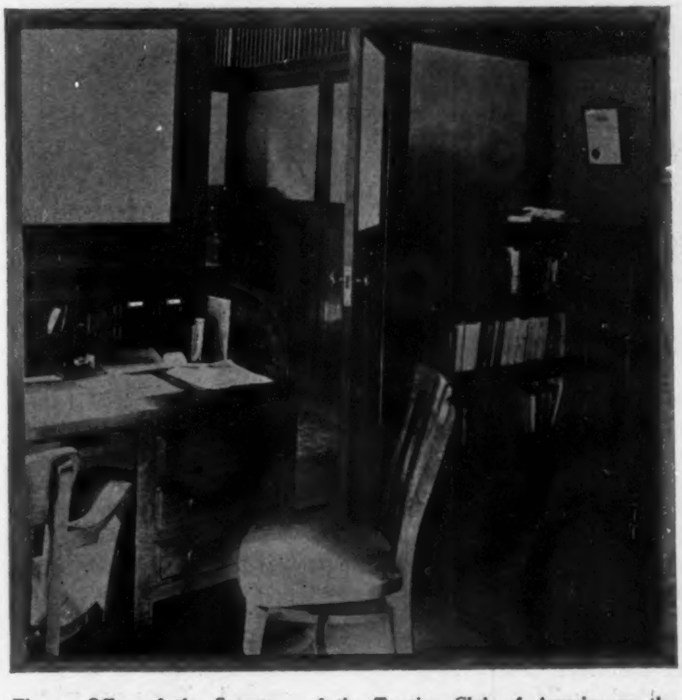


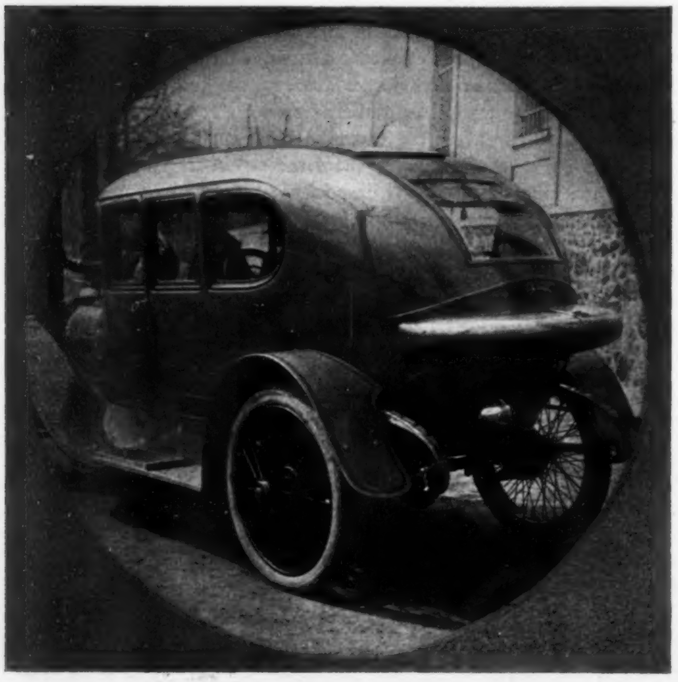
Fig. 4—Office of the Secretary of the Touring Club of America on the ground floor, under whose direction the machinery is kept in motion

France Solves Body Problem

Provision Made for the Spare Wheel

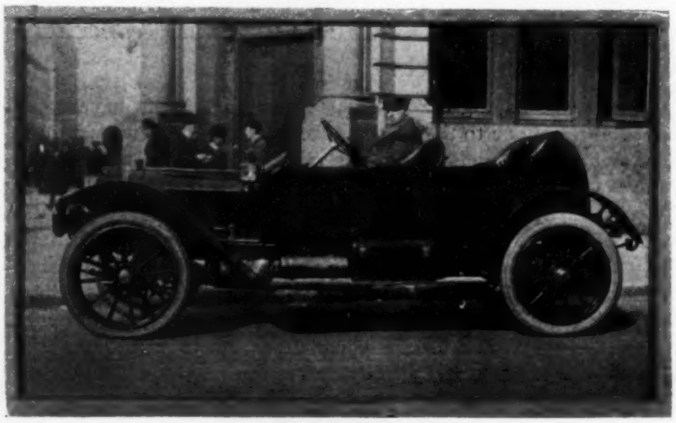
From Paris comes the latest effort involving "finished" automobiles with provision for the spare wheel within a suitably contrived compartment at the rear of the body, and a cover over the protruding portion of the spare wheel, the latter being endowed with the ability to arrest air currents as they sweep up from the road bed and impinge upon the underside of the envelope. This body is designated as the "submarine type."

THE four illustrations are of the latest body work of the Grégoire along submarine lines, and it is reported from Paris that this type of body is being taken up by the substantial automobilists abroad. An examination of the illustrations will suffice to show that there is but one side entrance, which is placed in the mid-position between windows, thus leaving one of the windows at the service of the occupants of the front seat, and the remaining window at the back for observation purposes for the occupants of the rear seat. The break at the front of the body comes back of the dash line equal to the distance of a considerably overhanging cowl as it would obtain in ordinary touring car work, and the excess space is taken up by the fuel tank, with a filler placed at the top of the diameter, and a control valve with its wheel extending out at the right hand side of the car.



New Grégoire four-cylinder car, with special submarine body intended to obviate air resistance and to overcome vacuum which forms behind rapidly moving vehicles, and showing slot (closed) for extra wheel.

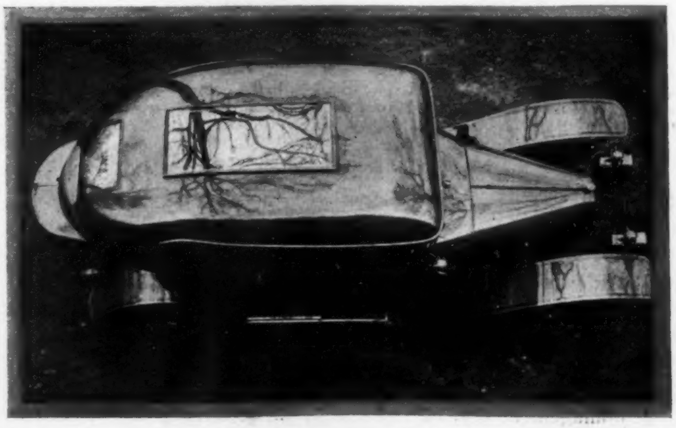
The shape of the car is, as the name implies, along submarine lines, and daylight is let into the body through the top as well as the sides, and a large-sized rear window, curved to give strength, and for appearance, is also provided. The spare wheel is carried in a suitably contrived compartment at the back of the car, and the aperture through the rear wall is of that shape which will permit the wheel, with its inflated tire, to enter with freedom, and when the tire is thus disposed of, a suitably contrived cover is fastened into place, leaving the general appearance all that could be desired in view of the rather odd-shaped body as a whole. The height of the body is rather less than that which seems to obtain in conventional limousine work, and the shape is structurally without criticism; moreover, from the cost point of view, this body should exhibit a line of economies that will prevent it from occupying the foremost position from the point of view of "high-priced" luxuries. The body belongs to the utility family, and its common sense features appeal to those who have had experience in the purchase and use of automobiles.



Side view of the Club Car, showing the lines of the standard gunboat body and the position of the rear seats in front of rear axle.

M. A. M. Elect Three Members

Three more members have been admitted to the Motor and Accessory Manufacturers. They are as follows: E. W. Bliss Company, machinery, Brooklyn; the Interstate Foundry Company, gray castings, Cleveland, Ohio, and the Texas Company, gasoline and lubricants, New York.



Looking down upon the new four-cylinder Grégoire, showing the pointed-nose radiator and glass top and rear lights.

Club Car of America

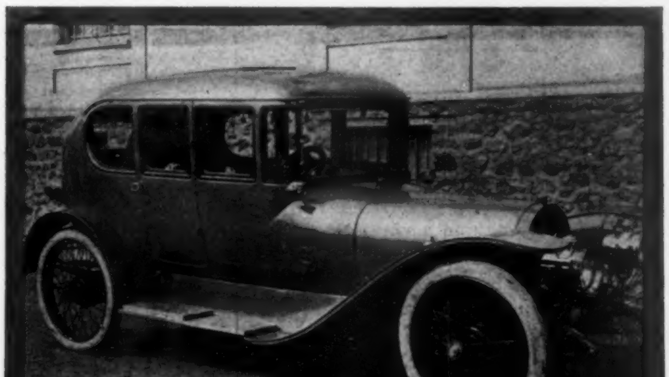
Organized under the laws of the State of Delaware, the Club Car Company of America was brought into being some time ago to furnish cars to members who took stock in the company, one share in the preferred stock being the necessary holding to secure the benefits of the company.

THE Club Car is made by the Merchant & Evans Co., of Philadelphia, and is fitted with an American & British motor of 40 horsepower, manufactured by the company of the same name, of Bridgeport, Conn. The cylinders are cast in pairs with all the valves located on the same side. The bore is 5 inches, with a 4¾-inch stroke. The lubrication is by splash, circulation being maintained by means of a gear pump. Carburetion is effected by

Three-quarter side view of the Club Car, showing a Star tire case in position on the running board.

means of a Stromberg 1½-inch carbureter. The radiator is of the honeycomb type, the water being circulated by means of a positive driven centrifugal pump. Bosch "two independent" high-tension system furnishes the electrical energy, the magneto being driven off the extension of the pump shaft. A Hele-Shaw clutch is used to transmit the power from the motor to the transmission, which is in the same housing as the live rear axle. The latter is an Evans patent and has two sets of bevel wheels, giving direct drive on the second and third speeds. The emergency brake, operated by lever, is of the internal expansion type acting on the drums attached to the driving wheels, and the foot or service brake operates on the same drums externally and is of the contracting band type lined with asbestos compound.

The front axle is of the Lemoine type, the front springs being semi-elliptical and the rear three-quarter elliptical. One feature of the car is the method of removing the motor from the chassis. A sub-frame is employed and is removable by undoing four bolts. The price of the car with complete equipment is $3,000.



Three-quarter view from the front of the four-cylinder Grégoire, showing the new design submarine body and clean running board.

Annual Spring Shakeup in Detroit

DETROIT, April 10—The Detroit retail trade is getting its annual spring shaking up. The results are not as radical as in several former years, however. H. D. "Bud" Moran, manager of the Abbott-Detroit's retail salesrooms, has accepted the offer of the Chalmers Motor Company and will take charge of the factory branch which the company has established at 268 Jefferson avenue. This formally marks the taking over by the Chalmers company of their local sales, which have been handled ever since the days of the Detroit Thomas by Grant Brothers.

Grant Brothers have taken on the Everitt line in place of the Chalmers. They will continue, however, to handle the Amplex two-cycle car, a number of which are in use in Detroit.

The Lozier Motor Company is well established in its new factory on Mack avenue, though some of its employees, brought here from Plattsburg, have had trouble in securing houses.

During the past week the new building of the United Motor Detroit Company, Woodward avenue and Bagg street, was finished and occupied. The new offices are among the finest in the city, while the salesroom is ample in size. A feature of the equipment is an immense stock room where spare parts will be carried for all the cars of the United Motors line.

Truck Service Building for White

The White Co. announces that it has disposed of its service building in West End avenue, and has acquired a large plot of ground on West Fifty-seventh street, where it will immedi-

Close view of the rear of the new Grégoire submarine, which serves the double purpose of extra-wheel carrier and a means of overcoming the vacuum which forms behind rapidly moving vehicles with square bodies.

ately construct a building especially designed for the economical handling of motor trucks. The plot is on the north side of Fifty-seventh street, between Eleventh and Twelfth avenues, and is of 250 feet frontage by 100 feet in depth.

W., C. & P., Inc., Secures Mathewson

Brockholst Mathewson, for ten years on the advertising staff of *Collier's*, has resigned to take an executive position with Wyckoff, Church & Partridge, Inc., manufacturers of trucks and touring cars. He will handle and train the sales forces and intends to enlarge the selling field of the company.

New Things Among the Accessories

Means for Detecting Faulty Spark Plugs

THE "trouble finder," shown attached to a spark plug in Fig. 1, is made by the Motor Necessities Manufacturing Company, 140 West Federal street, Youngstown, O. With one of these devices fitted to each plug of the motor it is possible to ascertain without undoing any connections which of the plugs are missing fire. The knob is here shown pushed down so that the plug is short-circuited, and by pressing down three out of the four alternately on a four-cylinder motor it will be possible to see if one cylinder is working better than another. In case the source of trouble does not lay in the plug, by causing the point of the wire to form a gap of about 1-16-inch at the plug base it is possible to ascertain if any current is arriving at the plug.

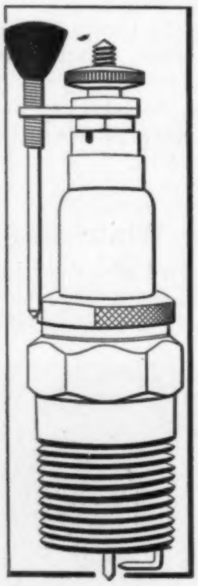


Fig. 1—The Trouble Finder shown fitted to a spark plug.

Jack for Lifting Four Wheels at Once

THE fitting shown in Fig. 3 is designed for the purpose of lifting the four wheels of a car simultaneously and comprises two frames, constructed of steel uprights held rigid by heavy steel cross-bars. These bases are connected by several feet of chain. The frames are tilted at an angle under the front and rear axles. The differential screw seen in the illustration pushes the car backward a few inches, bringing the frames into a vertical position, thus elevating both front and rear axles at the same time. It can be used for several purposes, and will prove a useful adjunct to the garage. The jack is manufactured by the Reading Automobile Co., 126 North Fifth street, Reading, Pa.

An Easily-Fitted Muffler Cut-Out

THE muffler cut-out shown in Fig. 2 can be fitted to the exhaust manifold of any car without disturbing it. A small portion of the under side of the pipe is sawed away and the cutout can be clamped in position. Several sizes are made to fit different diameter piping and it can be connected for use with either pedal or lever control. In order to overcome leakage at the valve it is made to open against the exhaust pressure. It is manufactured by the S. B. R. Specialty Co., East Orange, N. J.

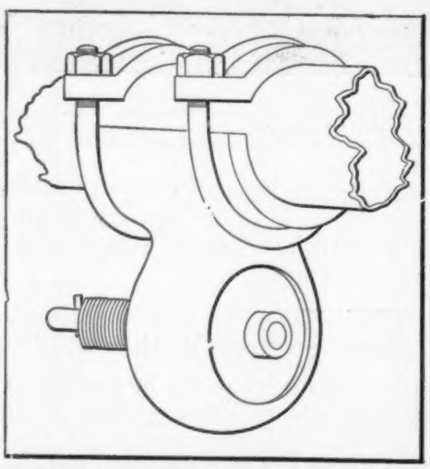


Fig. 2—S. B. R. Muffler Cut-out, showing the attachment to an exhaust pipe.

Small but Powerful Electric Horn

THE Clymax electric horn has a small iron-clad bi-polar motor with a slotted armature which runs on ball bearings; at the end of the shaft there is a hammer with four points that come in contact with three points on the diaphragm. There is a tension spring back of the hammer that regulates the blows of the hammer on the diaphragm by allowing the hammer to reflex. This hammering on the diaphragm causes the sound that is transmitted through a bell trumpet. The horn is manufactured by the Nonpareil Horn Manufacturing Company, 73 Wooster street, New York City.

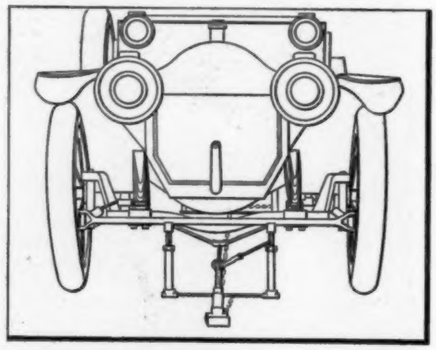


Fig. 3—Four-wheel Auto Jack shown attached to the front axle of a car. With this device all four wheels may be lifted from the floor at the same time.

New Spark Plug with Novel Features

THE Hartford arc-light plug is built on the lines of an arc light, with the points directly in line. These are strongly supported and protected by the heavy guard surrounding them. The plug can be readily taken apart as shown in Fig. 4. There are no gaskets; the upper part and the base make a metal-to-metal contact on an angle of 45 degrees. The construction of the plug is such that there is a continuous pumping action of the gases at the arc which tends to keep the points clean. The wire terminal holding member is so constructed that it will hold any of the terminals on the market. The plug is guaranteed for a period of one year and is manufactured by McIntye Machine Works, Hartford, Conn.

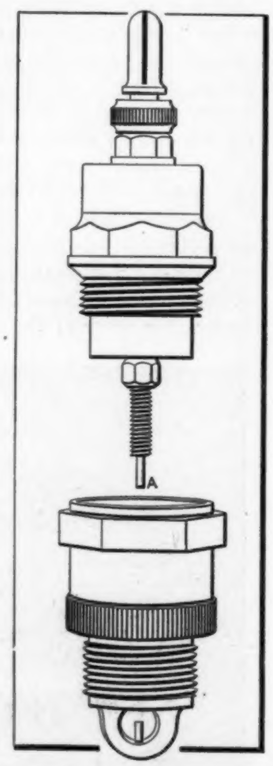


Fig. 4—Hartford Arc Light Plug, showing the upper part unscrewed from the base.

Little Nemo Electric Tail Light

THIS rear lamp is small and compact and is fitted with a polished reflector showing a red light toward the rear and a white light on the number plate. A tungsten bulb is supplied with the lamp and the cable attachment by means of a bayonet fitting. The C. S. license bracket is designed for use with the Little Nemo light, and can be fitted to the lamp bracket. These fittings are manufactured by Culver-Stearns Mfg. Co., Worcester, Mass.